Content Assessment for a South Carolina Coastal Low Impact Development (LID) Manual

An internship report submitted in partial satisfaction
Of the requirements for the degree of

MASTER OF SCIENCE

In

ENVIRONMENTAL STUDIES

By

LAURENCE PATTON SUTLEY

April 2011

at

THE GRADUATE SCHOOL OF THE COLLEGE OF CHARLESTON

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ABSTRACT

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This project is a basic needs assessment used to develop the content for a South Carolina coastal specific Low Impact Development (LID) Manual. Coastal Carolina communities are particularly vulnerable to change and degradation as a result of conventional development. The coastal zone's dynamic environment must be considered when planning for development to meet current and future demands. It is necessary to provide a guide to Best Management Practices (BMPs), regulation creation, and implementation that is not only comprehensive but also user friendly to help decision makers and stakeholders effectively transform the development process in the various coastal communities. For the manual to be comprehensive, effective, and widely accepted it is important to consider the input of the stakeholders, especially the end users. The ACE Basin National Estuarine Research Reserve's (NERR) Coastal Training Program (CTP) provides local communities, private enterprises, and policy makers with science based training and workshops. In this effort, the CTP partnered with the South Carolina

Sea Grant Consortium, South Carolina Department of Health and Environmental Control (DHEC), Carolina Clear, South Carolina Department of Natural Resources, National Oceanographic and Atmospheric Administration (NOAA)'s Coastal Services Center, Ashley Cooper Stormwater Education Consortium, and the Coastal Waccamaw Stormwater Education Consortium to organize three stakeholder meetings to accomplish the goal of thoughtful, effective policy guidance. The meetings, broken into information based and discussion based sections, were aimed at gathering input from stakeholders about various aspects of concern and content for a Coastal LID manual. Information gathered from the discussion groups was used to design a web-based survey. The survey was distributed to a large number of stakeholders and was aimed at gathering additional input regarding the content requirements for an LID manual. The results of the survey were then compiled and carefully analyzed to determine the respondent intent and to identify their expressed needs in terms of a coastal LID manual.

Acknowledgements

I would like to thank the many people and partners involved in this internship project as well as all those who have had an impact on my MES program experience.

I acknowledge my committee members, Professor Layne West, Dr. Chris Ellis, and David F. Joyner, for their time and help in designing and carrying out my project, proofreading my work, and providing support throughout the process.

Special thanks to Rebekah Walker for allowing me the opportunity to learn new professional and social skills through the application of CTP programs. Her guidance to and through this project was essential and her support is greatly appreciated.

Thanks also go out to all the partners who helped plan and coordinate workshops; the South Carolina Sea Grant Consortium, South Carolina Department of Health and Environmental Control (DHEC), Carolina Clear, South Carolina Department of Natural Resources, National Oceanographic and Atmospheric Administration's (NOAA) Coastal Services Center, Ashley Cooper Stormwater Education Consortium, and the Coastal Waccamaw Stormwater Education Consortium. Especially the planning team; Becky Walker, Amanda Nodolf, Sarah Skigen, Amanda Flake, Karen Fuss, Dan Newquist, April Turner, Dave Joyner, Ford Tupper. As well my thanks goes out to all of the speakers who gave up their time to assist with this worthwhile project; Christy Perrin, Dave Briglio, Courtney Reich, Lisa Vandevir, Jackie Teel, and Tara Merrill.

I am forever grateful to Mark McConnell and the entire MES staff for the support and guidance since my enrollment in the program, the College of Charleston, and the Graduate School in particular for the opportunity and experience.

Thank you to my colleagues in the MES program, SC DNR, and abroad; especially, Stefanie Simpson, Aaron Petty, Rebekah Walker, Phil Maier, Maia Ingle, Kim Counts and the entire staff of the Marshlands House.

To my Father, Mother, Sister, and Caroline for everything, I dedicate this project.

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Introduction

The Issue

As the nation's population continues to grow exponentially people will continue to live, recreate, and work along the coastline. The resulting, unfettered development will inevitably have a negative effect on the fragile coastal ecosystem. Twenty two of the thirty two largest cities in the world are located on a coastal estuary, similar to the ones found along the coast of South Carolina (Ross, 1995). This statistic serves as an indicator of human desire to live close to these productive and important coastal features. According to the 2010 U.S. census data, south Carolina's population has increased 15.3% from the year 2000 (U.S. Census 2010). That is the second highest population increase for the state in the last 100 years.

As populations crowd coastlines, the result may be a gradual decline in overall ecosystem quality unless better and more complete community planning takes place. This degredation may be caused by a number of factors including habitat loss, pollutant buildup from urban stormwater runoff, increased stress on economically important species, and most importantly an increase in demand for natural resources. In an effort to mitigate damage and degradation to ecosystem processes some coastal communities are adopting best management practices (BMP) and policies regarding development in an effort to manage growth and mitigate damage to local waterways. These policies too often solely focus on stormwater management and natural, historical site hydrology in post development standards.

Low Impact Development (LID) is a term often associated with BMPs for stormwater management, however, the essence of the term itself suggests that there are more impacts that must be considered when implementing development. In a previous assessment of stormwater management in South Carolina, 89% of the coastal decision makers indicated that LID is a term encompassing more than just stormwater management, including site plan and energy efficiency (Vandiver, Hernandez, 2009). Other states have developed LID manuals using needs assessments and found that the definition of LID was, in fact, very broad. For example, a North Carolina needs assessment states that the definition was consistent among both building professionals and government staff as "an approach to development which minimizes impacts on the natural environment through reduced ecological footprint and site disturbance, and retained vegetation" (Milburn, 2006).

Beyond stormwater there are many other factors to consider that can impact or be impacted by the implementation of LID. Development of any kind results in an increase in the demand on local resources. Something as simple as improved site design and consideration could mitigate demand for resources, including electricity, natural gas, water, and sewer. Additionally, development is often followed by landscaping. Without the consideration of the local ecology, landscaping can have serious and lasting detriments. By introducing non-native species there is a reduction in natural and appropriate biodiversity and available genetic material. Use of native vegetation decreases the demand for watering and fertilizing and can aid in on site water retention.

The impacts of development are well documented and too are the development practices and techniques that can mitigate impacts. Communities along the South Carolina coast need guidance on how to implement these practices and techniques at the local level. It is apparent that an LID manual is a relevant response, providing all coastal stakeholder groups with a guide to implementation. In order to make the manual effective, comprehensive, and as widely accepted as possible, stakeholders have been identified and consulted prior to the manual's creation. Input from end users increases the likelihood that the manual will be used and that when it is used it will be useful to the user and effective at promoting LID and mitigating impacts from development.

The Response

The Ashepoo-Combahee-Edisto (ACE) National Estuarine Research Reserve (NERR) began a process to respond to this need through its Coastal Training Program (CTP). In 1972, the Coastal Zone Management Act created the system of reserves through federal state partnerships between the National Oceanographic and Atmospheric Administration (NOAA) and the coastal states which host the reserves. The ACE Basin NERR is one of two South Carolina Reserves and one of the 28 nationally created Reserves (Figure 1). The ACE Basin NERR, as well as all the others, are focused on resource stewardship, monitoring of estuarine conditions, management-oriented research, technical information transfer, and environmental education (ACE Basin NERR 2010). The Reserve System offers professional trainings on issues of concern within communities, provides estuarine education to K-12 students as well as targeting teachers

with professional development programs, provides long term water quality monitoring and biological monitoring, and creates opportunities for scientist and graduate student research.

Figure 1: Map of the National Estuarine Research Reserves.
(Source: http://nerrs.noaa.gov/ReservesMap.aspx)

The ACE Basin NERR was established in 1992 as a partnership between NOAA and the South Carolina Department of Natural Resources (DNR). The Reserve encompasses approximately 94,621 acres of diverse habitat in Beaufort, Colleton and Charleston Counties in southeastern South Carolina (Figure 2). Since its inception, the ACE Basin partnership has used purchases, conservation easements, and management agreements to protect well over 200,000 acres (ACE Basin NER Management Plan 2011). Education is a large part of ACE Basin activities through student curricula, field

trips, adult lectures, teacher workshops, volunteer programs, and a wide variety of printed media (ACE Basin NERR 2010).

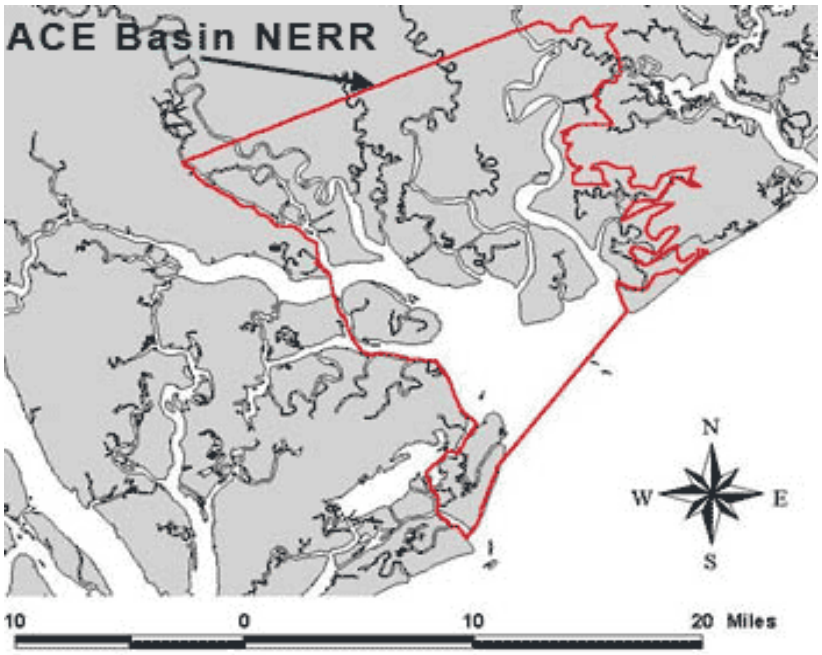

Figure 2: The ACE Basin NERR Boundary.
(Source: http://www.dnr.sc.gov/marine/NERR/about.html)

To help meet the needs of local decision makers, the Reserves have implemented the Coastal Training Program (CTP). The CTP aims to

> "…address critical coastal resource management issues by providing the most up-to-date scientific information, access to technologies and skill-building opportunities to key professionals responsible for making decisions about coastal resources. Topical areas include coastal habitat restoration, water quality, stormwater management, land use and coastal development Issues. Programs target land-use planners, elected officials, regulators, land developers, community groups, environmental non-profits, private consultants and business leaders."

The CTP provides science-based training to coastal decision-makers and fosters collaborative networking opportunities within the coastal zone. It holds workshops and trainings throughout the year aimed at bridging the gap between sound science and policy

formation, implementation, and regulation. The Coastal Training Program was formally introduced in 2001. The goal of the CTP is to have "better informed decision-making by local and regional coastal decision-makers to improve coastal stewardship." Coastal decision makers are defined, according to the NERR System website, as individuals whose duties include making decisions that affect the coast and its resources (NOAA 2009).

The CTP, in meeting the goal of the program, works closely with various partners. To meet the need of an LID manual the CTP made use of this network of partners to develop both a series of workshops as well as a survey. Both were designed to determine how best to address the needs of the LID manual's users. Partnerships are just one way the ACE Basin NERR works to address issues and concerns that affect the coastal communities of South Carolina.

Project Scope

Coastal decision makers, various stakeholders, and other concerned citizens that frequently utilize CTP trainings at both the ACE Basin Reserve as well as South Carolina's other Reserve, the North Inlet-Winyah Bay NERR, have made their interest in a comprehensive LID manual well known. Participants of several past meetings on LID in South Carolina have expressed support for and interest in developing an LID manual for the state that will help to foster acceptance of LID as a practical, commonplace management tool. Upon determining there were no current initiatives to develop such a manual, and there was sufficient demand for this type of document, the South Carolina

CTPs began a process to develop a coastal manual and this project was taken on to develop a comprehensive manual that addresses the needs of the coastal communities.

The ACE Basin CTP partnered with the South Carolina Sea Grant Consortium, South Carolina Department of Health and Environmental Control (DHEC), Carolina Clear, South Carolina Department of Natural Resources, NOAA's Coastal Services Center, Ashley Cooper Stormwater Education Consortium, and the Coastal Waccamaw Stormwater Education Consortium to prepare an information transfer with South Carolina coastal decision makers about developing LID practices, policies, and guiding documents. This information transfer occurred in the form of three stakeholder meetings: one in Conway SC, one in Charleston SC, and one in Beaufort SC. The meetings, titled *South Carolina Coastal Low Impact Development (LID) Manual: Needs, Use, and Lessons Learned* served two purposes. The first purpose was to give insight and detailed information about content topics, effective formats, and appropriate uses of a coastal LID manual.

The second purpose was to act as a scoping device to design a survey which would be the main data collecting tool in the project. Focus group discussions help narrow the scope of the survey. Additionally the focus groups established what the various groups of stakeholders within the community need guidance on in terms of LID application. The survey was more in depth than the focus group discussions and attained the pieces of information needed from respondents to develop an LID manual that is comprehensive, effective, and widely accepted.

A coastal specific manual will address the problem of developing effective policy that deals with the very real problem of burgeoning development and the detrimental effects that it has on estuarine ecosystems. This project identifies the knowledge base that exists with coastal decision makers and attempts to bridge the gaps in knowledge with a comprehensive, and widely accepted manual.

Literature Review

The concept of Low Impact development **(**LID**)**, as it is currently known, has not been in existence very long. It was first introduced in Prince George's County, Maryland in the 1990's. Because of its proximity to Washington D.C., Prince George's County experienced rapid residential, commercial, and industrial growth. It was endowed with abundant natural resources such as a vital network of freshwater streams and rivers which needed to be protected, as well as abundant developeable land. From this came the development of Low Impact Development (LID) and the policy of stormwater control through the creation of a hydrologically functional landscape that mimics the natural hydrologic regime (Prince George's County 1999). The Department of Environmental Resources in Prince George's County has since developed several manuals and handbooks to guide LID implementation and regulation.

Since that time many communities have come to adopt LID principles and policies, and there are a number of resources available around the country to guide decision makers when implementing LID. Both North Carolina and Georgia have developed guides with their own unique manuals, Low Impact Development: A

Guidebook for North Carolina, and the Green Growth Guidelines and Coastal Stormwater Supplement, respectively. The U.S. Department of Housing and Urban Development has *The Practice of Low Impact Development,* a document that claims to be designed for "housing professionals" but does not address the concerns of many other interests (U.S. Department of Housing and Urban Development 2003). The Environmental Protection Agency's own *Low Impact Development: A Literature Review* is admittedly out of date. Being published only a little over a decade ago the agency admits to needing more long term analysis (U.S. Environmental Protection Agency 2000). South Carolina's Department of Health and Environmental Control has its own LID best management practices (BMP) Handbook, however, it is noticeably lacking in guidance on policy, cost, benefits, audience consideration and other background information. A more comprehensive LID manual is needed that can address the needs of a variety of situations, stakeholders, and decision makers and be used as a resource for the public as well as offer technical guidance.

In order to learn the needs of the coastal South Carolina LID manual audience this project elicited input from the various coastal stakeholder groups concerning content, format, and use of the manual. There are a number of qualitative and quantitative research techniques that can be used to interpret the will of research participants, and this project utilizes several, namely focus groups, key pad polling, and surveys.

Lehoux et al. (2006) describe focus groups as a qualitative method of interpreting the view of the study or research participants. They explain that this and other qualitative methods are useful in providing a better understanding of the rationales, processes, and

contexts that shape participants' views. Focus groups are, according to Lehoux et al. (2006), a qualitative method of extracting what they call the "patient's view." and are unique because they create a social interaction between participants. They create social spaces in which participants construct a common view by sharing, acquiring, and contesting knowledge (Lehoux et al. 2006).

Morgan (1996) believes that focus groups are a "technique that collects data through group interaction on a topic determined by the researcher." However, even though they can be used to collect data there are inherent problems that must be addressed. The issue of controlling the conversation is an issue best dealt with by using facilitators and grouping participants that share similar characteristics adding fluidity and depth to the discussion (Lehoux et al. 2006). There are two instances during the focus group discussion that influence how participants relate to one another, first when common communicative ground is established and second when there is a contribution to the common ground (Hayden and Bulow 2003). Both of these instances are fostered by the facilitator's presentation of the discussion questions and by the selective grouping of participants into groups with similar characteristics. These research works have provided focus and guidance to the work performed and reported in this paper.

Keypad polling, used during the workshops, was aimed at gathering information about the workshop participants accurately and quickly. Keypad polling is a method of inquiry in which participants are given a remote keypad then are asked questions (see Appendix C) with possible responses chosen by pressing the corresponding letter on the keypad, also known as audience response system (ARS). The responses are displayed

immediately and openly to the entire group affording transparency to the process and directing responses into common parlance so that interpretation can be rapid and consistent with the intended menaing. Keypad polling had a positive impact on the meeting by allowing participants the opportunity to let a perspective or opinion be heard when it would otherwise not be possible (Campt and Freeman 2010). Campt and Freeman (2010) believe that the results from keypad polling "…create a shared and somewhat objective picture of the diversity of the group mind that is less subject to interpretation than a summary created by a participant or the facilitator." The questions and possible responses for this project were chosen specifically to engage the group and give them insight into the peers that they would be interacting with during focus group sessions.

The main data gathering tool used for this research was the survey. In an effort to reach as many policy makers and stakeholders as possible the survey was web based which offered certain advantages over traditional mailing and phone techniques. Web based surveys reduce time and cost associated with the distribution and helps to avoid errors when entering data (Medin et al. 1999). Internet based surveys streamline the data collection process and allows for near real time feedback.

Methods

IRB Process

The planning and design of this project began, with the help of the ACE Basin CTP coordinator and the LID manual planning team, in the fall of 2010. A detailed description of the methodologies was submitted to the College of Charleston's

Institutional Review Board (IRB) for approval in January of 2011. The project was approved as exempt under exemption category 2[1] on February 14th, 2011.

Planning

To achieve the goal of creating an LID manual, many preliminary steps have been taken. However, the project at hand was not designed to create an LID manual, but rather to determine the necessary input and informational components needed to create an LID manual. The project focused on data gathered from the stakeholders, analysis of the data to determine current trends, and a report that documents the findings.

Identification of partners was the first step in the process of manual creation. Organizations that have similar target audiences and constituencies were easy to identify because a South Carolina coastal LID manual has been a common topic and a much discussed goal. Demand for a publication of this nature fosters partnerships that are essential when trying to gain a comprehensive view of the issue. The partners were critical in identifying potential participants, drafting and editing mailings and scripts, and organizing the format of meetings, surveys, and the final report.

The next step was to capture data from stakeholders. For this purpose three meetings were set, with the help of partners, for the coastal area of South Carolina. In an effort to get diverse or broad coverage of the coastal area of South Carolina meetings

[1] College of Charleston IRB Exempt Category 2: Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior, unless: (i) information obtained is recorded in such a manner that the human participants can be identified, directly or through identifiers linked to the participants; AND (ii) any disclosure of the human participants' responses outside the research could reasonably place them at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation. [46.101 (b)(2)]

were held in Conway, on the north coast, Charleston, mid-coast, and Beaufort, on the south coast, in January of 2011. These meetings targeted stakeholders that have an impact on the coastal communities in the state. Individuals such as county and municipal planners, stormwater staff, developers, engineers, architects, regulators, consultants, and other relevant stakeholders. Recipients of the announcement email were identified through the ACE Basin NERR database as well as through the contacts maintained by partners. A copy of the announcement flyer can be found in Appendix A.

A planning team, made up of myself, the ACE Basin CTP Coordinator, and representatives from each partnering organization, developed the meeting agenda, key pad polling questions, and the focus group discussion questions. The planning team was also involved in the identification of workshop participants, facilitators, and note takers.

Workshops

The meetings were divided into two sections; a morning session focused on providing information on existing regionally significant LID manuals as well as currently available resources, followed by the afternoon session focused on gathering information and opinions about the appropriate content of a coastal South Carolina coastal LID manual. The morning session consisted of speakers from South Carolina, North Carolina, and Georgia. Dave Briglio and Courtney Reich presented on the state of Georgia's Coastal Stormwater Supplement to the Georgia Stormwater Management Manual. This presentation was an overview of the supplements content, format and implementation. Tara Merrill, also from Georgia, presented on Georgia's Green Growth Guidelines and its

development and application. These presentations gave participants the opportunity to see what a manual could look like and what topics and information neighboring states found useful or important to include. The purpose was to allow South Carolina participants to build on what other states have already done and experienced so that the South Carolina manual is seemlesly transformed into an accepted policy tool.

Christy Perrin, from North Carolina State University, talked about the post-implementation barriers and incentives for their publication, Low Impact Development: A Guidebook for North Carolina. She gave a presentation that outlined North Carolina's process and experience in developing the North Carolina LID guidebook. She offered examples of the possible topics and concerns that could be addressed in a similar document produced for coastal South Carolina.

Participants learned about current resources available to them within the state and significant LID efforts already in place from Lisa Vandiver of the University of South Carolina's Department of Environmental Health Sciences. She spoke about the implementation of LID practices along the South Carolina coast, citing local case studies, regulations, obstacles, and available and current practices. A useful aspect of her presentation was the identification of regional needs in stormwater management based on research conducted as part of her PhD dissertation.

After the various presentations, participants were asked to answer questions regarding their jobs and specific duties, their definition of Low Impact Development, and aspects of LID via key pad polling. This allowed participants to see, in real time, who

was participating alongside of them and what their peers considered to be important aspects of LID. This also allowed participants to become aware of alternative viewpoints of LID. Example definitions were provided and participants were given the opportunity to choose from among them or write in an alternative definition. Participants were provided with and allowed one hour for lunch, which was an opportunity for them to discuss the morning's presentations as well as network with others implementing LID throughout the community.

The afternoon session was aimed at gathering information. Participants were divided into focus groups for this part of the workshop. Each focus group had a facilitator with discussion based questions (see Appendix B) designed to elicit input from the group regarding which possible components of an LID manual would be most relevant and necessary for coastal South Carolina. Note takers recorded the input by keeping detailed notes of the conversations and responses to discussion questions.

Notes were analyzed using open coding, a form of data analysis first discussed as a part of the Grounded Theory as noted in the book by Glaser and Strauss (1967). Open coding, also known as substantive coding or axial coding, is the process of conceptualizing open ended data so as to develop concepts that then stand for the data (Strauss and Corbin 1990 pg. 66). Strauss and Corbin (1990) think of coding as "mining data" to discover hidden treasures within. Concepts are developed for each statement and then those concepts are categorized and grouped to reveal trends and intentions. To ensure that the notes were not taken out of context they were compared to detailed flip

chart notes taken by the facilitator of each focus group. Special care was taken to interpret the intent of each statement. It is insufficient to merely count the codes and assign significance to those that occurred most frequently. Some statements might have been mutually agreed upon as important and hence only mentioned once while other topics, possibly more controversial, may have been mentioned or brought up multiple times. For the purposes of this project the issues and concepts that received the most concern are those that need elaboration and additional feedback. The final interpretation of focus group comments was used to compile more in depth questions for the detailed survey. A complete list of codes developed form focus group discussion can be found in Appendix D.

Workshop attendees were asked to complete a workshop evaluation to determine the effectiveness of the training and gather input on the CTP effectiveness. The survey was not used for the purposes of this research but is instead intended to gather input and feedback for future CTP trainings.

Survey

Since it is impractical to expect all stakeholders in the coastal region of South Carolina to be able to attend one of the meetings, the information obtained by the note takers and through the keypad polling was used to design a more targeted and in depth survey. The survey was disseminated to a large portion of coastal decision makers and individuals with a significant impact on the coastal community. Participants were identified through the database maintained by the ACE Basin CTP as well as through the

contacts maintained by partners. Those individuals who received an invitation to participate in the survey were encouraged to complete and forward the invitations to others that they felt have an interest in the final product.

The questions were developed by taking the responses to the three general questions from the workshop's focus group discussions, and breaking them down into more specific categories for further expansion. For example focus group participants were asked what information would be most helpful to them in an LID manual? Generally they responded with concerns about BMP's, site conditions, maintenance, and case studies as most important for the manual's content. From that, survey questions were designed to elicit the specific concerns that each stakeholder group has about BMP's, site conditions, maintenance, and case studies. The end result was a comprehensive look at the needs and concerns of the proposed manual's end users, assuring success and acceptance.

The resulting survey was made available through surveymonkey.com, a web based survey platform. As noted by Solomon (2002) combining the survey with an email "cover letter" makes the approach much more effective by prefacing the survey with background information and intent for the response data's use. For that reason the survey being used with this project was accompanied by an introductory email (see Appendix F) as well as a follow up reminder.

Open ended survey question responses were then coded using the same open coding technique as was used to decipher the focus group notes. The concepts identified

in the survey responses were somewhat more difficult to interpret than those from the focus group since the advantage of having a personal interaction and third party recount of that interaction is lost. The simple text of open ended responses can be easily taken out of context so they must be read carefully since the background of the author is unknown. Responses were required to be coded for multiple potential meanings and concepts so that the full intent of the participant could be captured. A complete list of the codes developed for these questions can be found in Appendix E.

Results

Workshops Summaries

Beaufort Workshop

This workshop was held on January 12th, 2011, at the Technical College of the Lowcountry in Beaufort, SC. The participants were representative of the stakeholders of the southern coast of South Carolina, and also of the ACE Basin NERR. Many of the participants are frequent CTP program attendees.

Key pad polling questions: Participants took part in a key pad polling session prior to separating into focus groups.

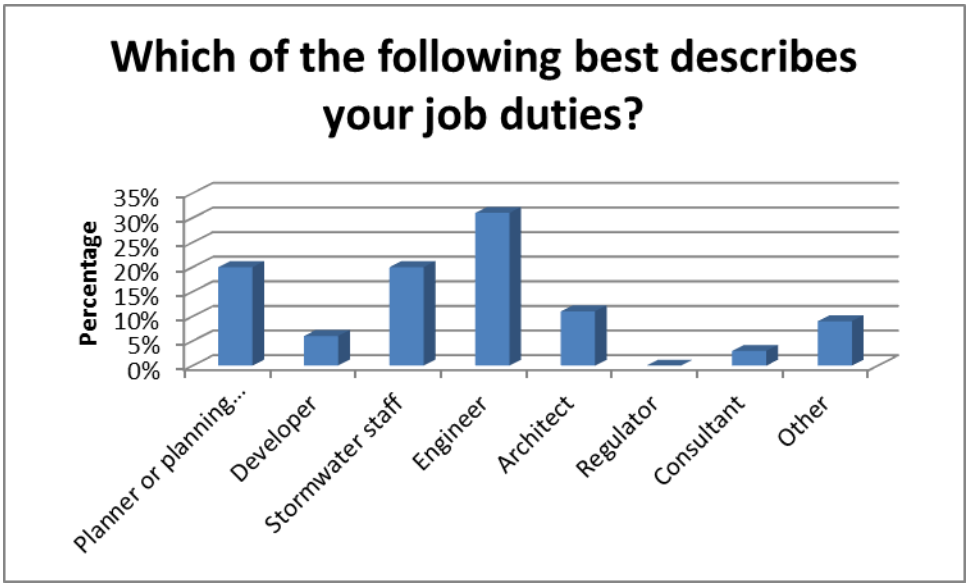

Figure 3: Job Duties, Beaufort

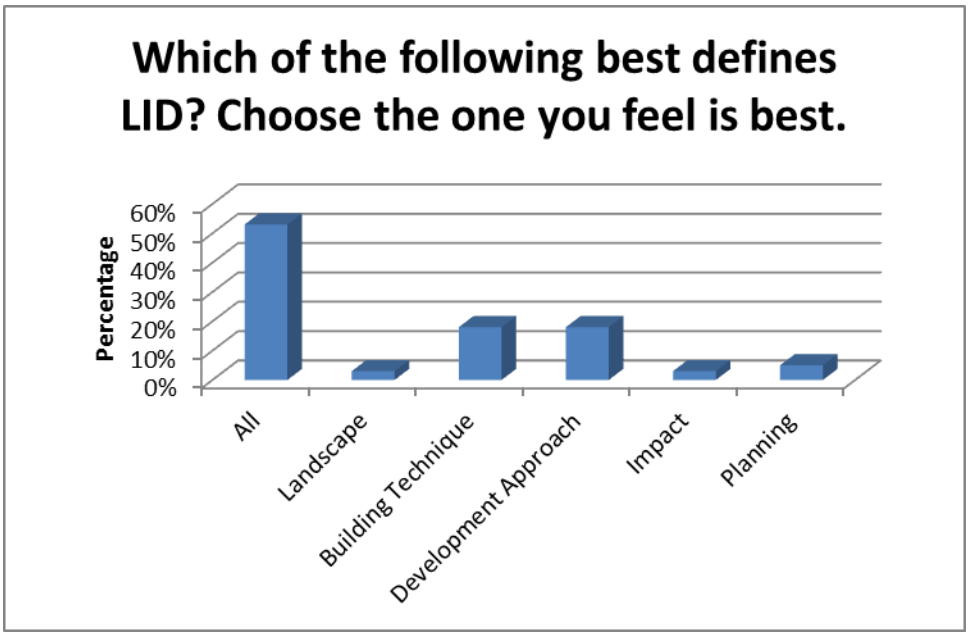

Figure 4: Definition options for LID, Beaufort. See Table 1 for full list of definitions.

Table 1: Definition Options

	Definition Options:
Planning	A land planning and engineering design approach to managing stormwater runoff
Landscape	A sustainable landscape approach that can be used to replicate or restore natural watershed functions and/or address targeted watershed goals and objectives
Building Technique	The practice of using techniques in building and construction that minimize the effect that development will have on the quality of the surrounding environment
Development Approach	An approach to land development that uses various land planning and design practices and technologies to simultaneously conserve and protect natural resource systems and reduce infrastructure costs
Impact	A development that has less impact on the environment than a traditional development
All	All of the above

This workshop was made up mostly of planners, stormwater staff and engineers. The majority of the participants chose the "all of the above" option when choosing a definition for LID. (see Table 1)

97% of the Beaufort workshop participants indicated that stormwater control is an aspect of LID. The same number of participants indicated that minimizing impact on the natural environment is an objective of LID. 98% noted that a site's natural hydrology and pre-development conditions are considerations when implementing LID practices. This workshop's participants were generally split with 47% of the group indicating that building stratedies that minimize energy consumption are an aspect of LID. The majority, 84%, said that development with low density was not indicative of LID. Lastly, most participants, 52%, indicated that they had at least some experience and limited knowledge with LID.

Focus Group Discussions: Participants were divided into three groups based on their job affiliation.

1. *What information would be most helpful to you in an LID manual?*

Discussion comments for this question focused on BMPs, design, maintenance, performance/standards, and site conditions/soils. These topics had the most statements coded to them and the results indicated that these are the priority topics when considering what the content of the manual should be.

Sample Responses

- "Design and Installation Guidelines"
- "Manual needs to dictate who is responsible for maintenance (assign maintenance responsibilities to tie back to BMPs implemented);"
- "Why should we even implement LID; Need technically-oriented information re: results of actions; design criteria"

2. *How would you use an LID manual?*

Comments for this question revolved around three main categories; design guide, education, and guiding document. This indicates that these are the three areas in which the manual will be most used by these participants.

Sample Responses

- "To guide new regulations and ordinances – if not to just reference within an existing document (e.g., gives us leverage to push for changes in existing ordinances) "

- "Inspectors can use for field visits to check construction and maintenance"
- "Education for professional design community"

3. *Which organization of manual content would make it most user friendly for you? Consider the manuals presented today?*

Discussion revolved around the appropriate audience, cost, graphics, performance/standards, and technical information. These areas of concern when considering the manual's format will get elaborated on in the survey.

Sample Responses

- "Target sections to specific audiences audience driven"
- "Cost / benefit of LID versus traditional "
- "Appendix with examples: model ordinances, performance matrix, how it meets local and state regulations."
- "Use graphics where possible to give 'ranking' of cost and pollutant removal efficiency for ease of referral "

Conway Workshop Results

This workshop took place on January 24th, 2011, in Conway, SC, at Coastal Carolina University. The group that attended this meeting was representative of the stakeholders on the northern coast of South Carolina.

Key Pad Polling Questions:

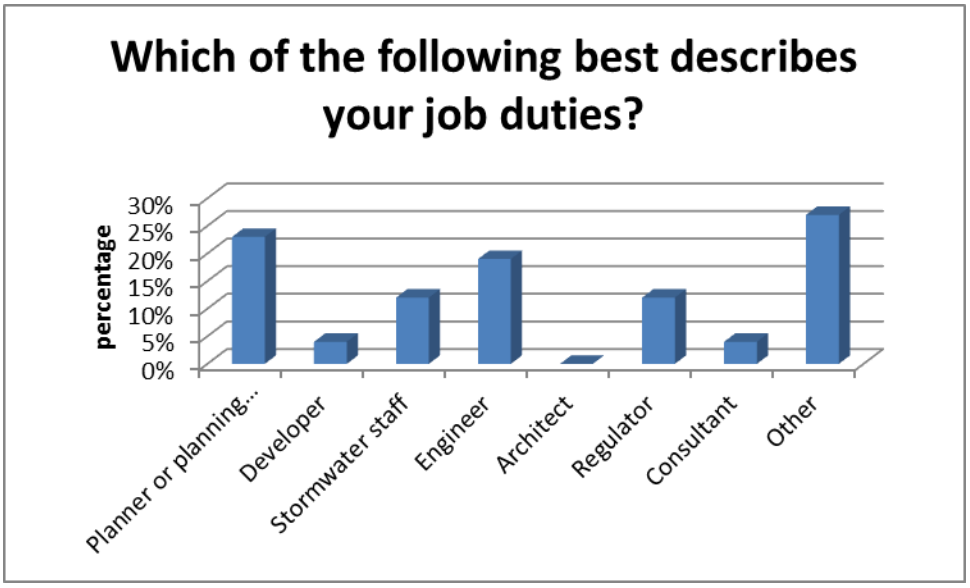

Figure 5: Job Duties, Conway

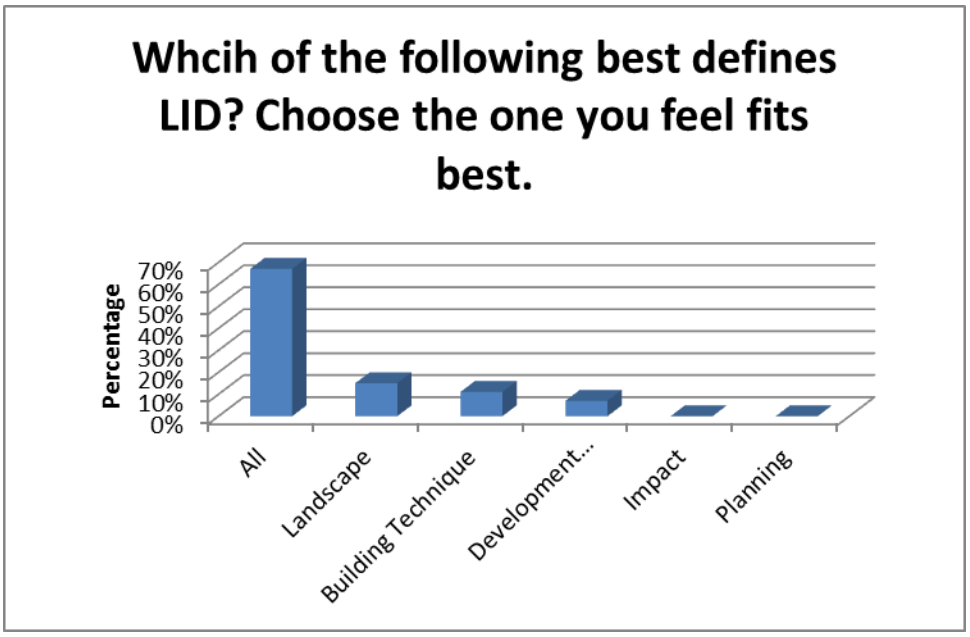

Figure 6: Definition options for LID, Conway. See Table 1 for a complete list of definitions.

Particiapnts for this workshop were more varied and diverse than the Beaufort meeting. Gaining a broad perspective through the opinions of a diverse stakeholder subset is beneficial to understanding the needs of each group individually. Again

participants chose “all of the above” when asked about the definition of LID, indicating that they feel LID is a broad term that can be interpreted to cover more than just stormwater management (see Table 1).

96% of the participants at this meeting indicated that stormwater control is an aspect of LID. It was unanimous among participants that minimizing impact on the natural environment is an objective of LID and that a site’s natural hydrology and pre-development conditions are considerations when implementing LID practices. Again, the group was split as to whether building strategies that minimize energy consumption are an aspect of LID. A slight majority of 67% of the participants noted that development with low density was not indicative of LID. Most, 56%, indicated that they had at least some expereicne and limited knowledge with LID.

Focus Group Discussions:

1. *What information would be most helpful to you in an LID manual?*

The Discussion on this question seemed to revolve around information on BMPs, case studies, and site conditions and soils. Participants indicated that examples of BMPs and estimated efficiencies would be helpful and in addition provide specific case studies that reinforce those estimates. This was a similar response to the first group indicating a common set of concerns from geographic area to area.

Sample Responses

- “Examples of BMP’s that really work in our area “

- "Case studies on LID vs. conventional would be useful, both good and bad real world examples with associated costs; a cost-benefit analysis is critical as well"
- "Cases studies based on geology/soils water table, elevation/gradient "

2. *How would you use an LID manual?*

For the use questions most participants said that they would use the manual for education, guidance, and influence. Education and guidance were identified as the most important uses for the manual. The manual would also be used to influence policy and development according to the focus groups.

Sample Responses

- "Professional development/higher education "
- "For approval of proposals and to expedite approval process"
- "A summary of information for the general public and for enforcement purposes – summary of impacts of problems/violations – guidance/ fact sheet"

3. *Which organization of manual content would make it most user friendly for you? Consider the manuals presented today?*

With regards to the manual's organization, participants felt that a strong introduction with background information would be very useful. Dividing the manual into sections based on audience was the general consensus among the focus groups and having a well laid out outline to follow was identified as important.

Sample Responses

- "Comprehensive plan, meant for everyone. In order to be that way much be user friendly, and technical aspects for multiple audiences"
- "General overview (for scope and explanation for the public – in more general terms)"
- "Table of Contents needs to be divided into chapters: planning, design, construction techniques, maintenance, and public education/outreach (step by step "life cycle of an LID")"

Charleston Workshop Results

This workshop was held on January 22nd, 2011, in Charleston, SC, at the Clemson Coastal Research and Educational Center. These participants represent the mid-section of the South Carolina Coast. Decisions made in this region can influence statewide policy and help to set the tone for statewide resource management.

Key Pad Polling Questions:

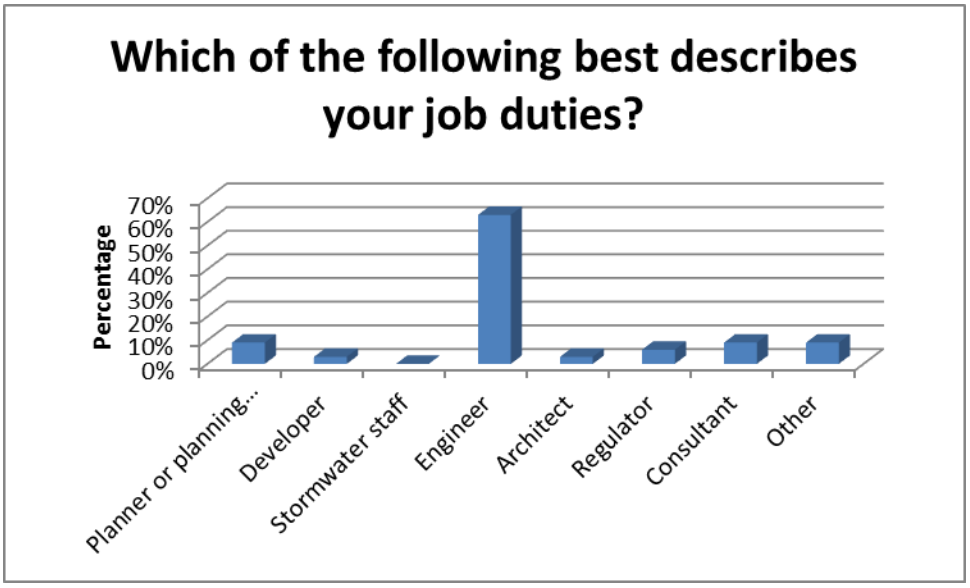

Figure 7: Job Duties, Charleston

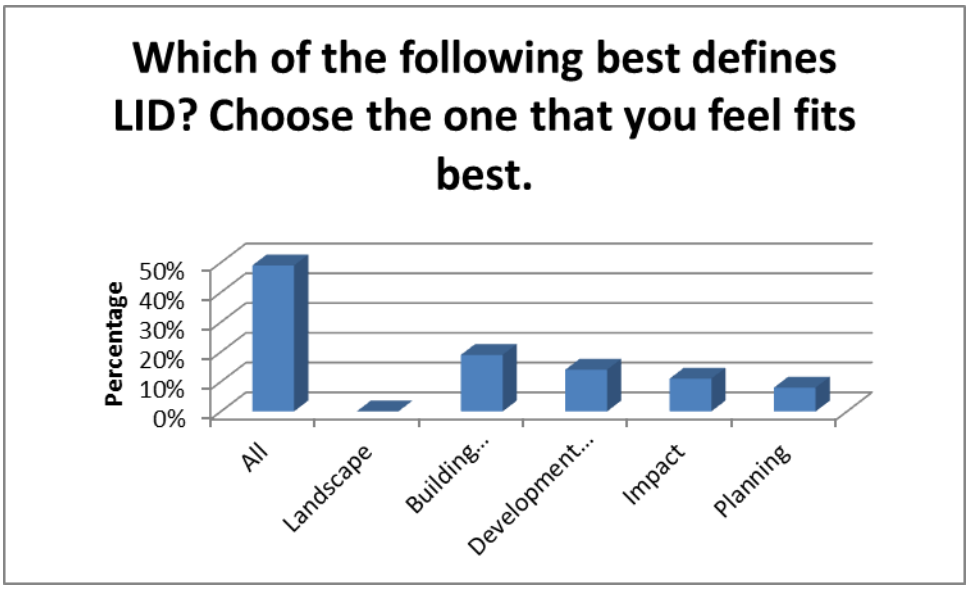

Figure 8: Definition options for LID, Charleston

This group was highly technical, made up of mostly engineers. Again “all of the above” was the popular choice for defining LID (see Table 1).

100% of the participants from this workshop consider stormwater control to be an aspect of LID. As well they all considered minimizing imnpacts on the natuarl

environment to be na objective of LID. When asked if a site's natural hydrology and pre-developemnt conditions should be considerations when implementing LID practices, 97% of the participants answered "yes." Again, the group was split as to the inclusion of building strategies that minimize energy consumption as an aspect of LID, with a slight majority of 63% noting that those strategies should be considered aspects of LID. 69% of the participants indicated that developemtn with low density was not indicative of LID. As before this group indicated that they had at least some experience and limited knowledge with LID.

Focus Group Discussions:

1. *What information would be most helpful to you in an LID manual?*

The focus groups identified, again, similar to the other workshop's groups, that information on BMPs was crucial to be included in the manual's content. They also indicated that spreadsheets and calculations would be useful, although they gave little detail about which calculations. They also said model ordinances and information on local regulations would help to overcome barriers to LID implantation.

Sample Responses

- "List of BMPs to be used and where they are not appropriate to be used (e.g., slope, soils, proximity to hardscapes)."
- "Calculations that show removal efficiencies, quantifications for regulatory use/concrete data"
- "Model ordinance - to expand and build on"

- "Compatibility with local regulations and ordinances as well as with existing infrastructure on the ground"

2. *How would you use an LID manual?*

Again education and guidance were identified as primary uses for the manual. As well focus group participants indicated the manual would be used to influence policy and development.

Sample Responses

- "Need to use as an educational resource (e.g., those responsible for maintenance)"
- "Must be integrated into ordinances, if it's simply responsibility of contractor/developer/land planner – won't work or be used"

3. *Which organization of manual content would make it most user friendly for you? Consider the manuals presented today?*

As with the other workshops, the focus groups noted that the manual should be organized by audience type. They noted that it should be a well organized and outlined document in digital format to allow for easy searching.

Sample responses

- "Organize by audience"

- "Use a digital format – need a good digital version; accessible and searchable as well as interactive links to allow for moving from section to section as relevant to user"
- "Links within the document to different sections makes it user-friendly"

Overall Workshop Results

Key Pad Polling Questions:

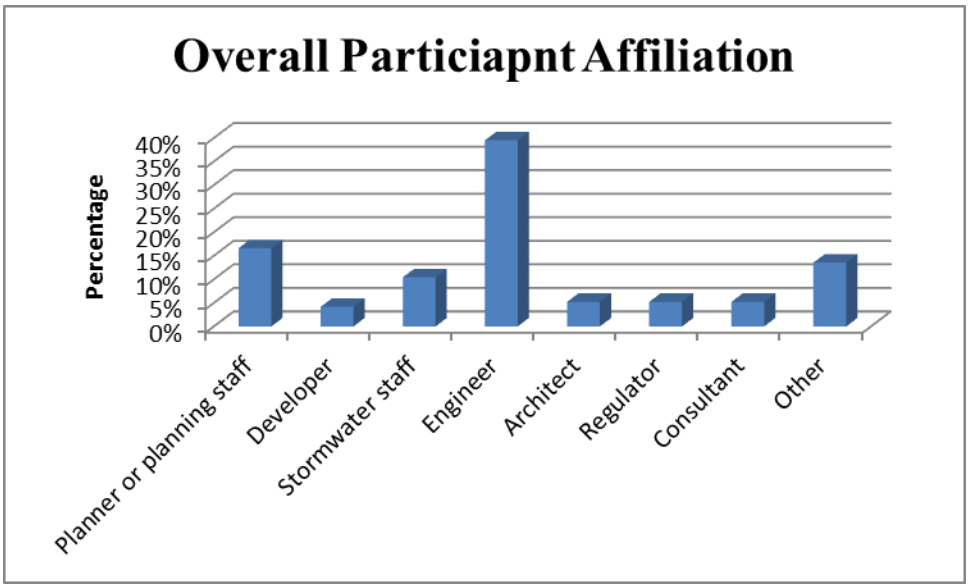

Figure 9: Job Duties, overall

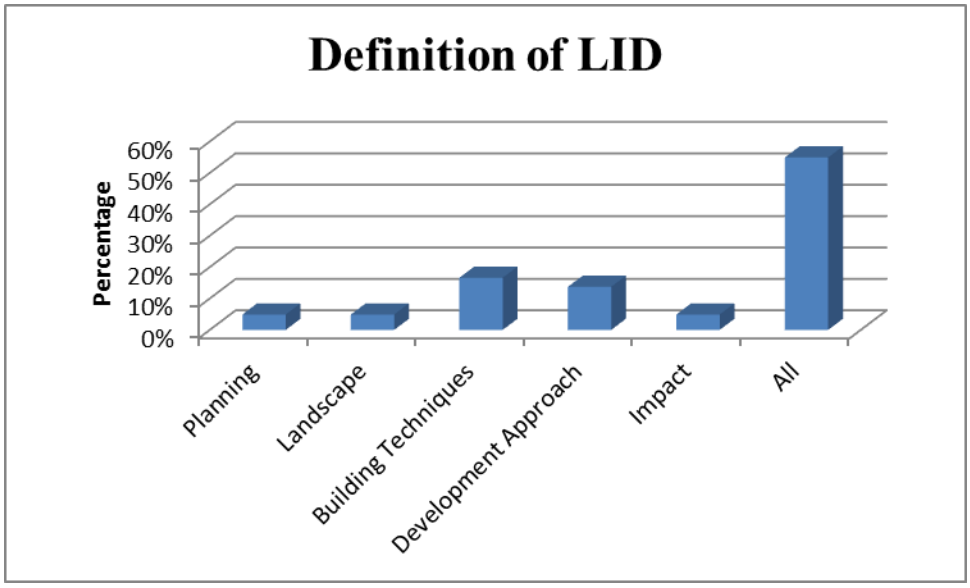

Figure 10: Definition options for LID, overall

Responses from the keypad polling questions were consistent among each of the three workshops. While participation in the workshops was from a diverse group, the dominant job affiliation was engineering. The majority of participants at each workshop chose "all of the above" as the most comprehensive option that defines LID (see Table 1).

Participants felt that stormwater control was an aspect of LID and that minimizing impact on the natural environment is an objective of LID. Additionally participants indicated that natural hydrology and pre-development site conditions were important aspects of consideration when implementing LID. Overall the focus groups were split in half as to whether or not building strategies that minimize energy consumption should be considered an aspect of LID. Low density development was not considered indicative of LID by 72% of all participants and the majority of participants indicated that they had at least some experience and limited knowledge of LID practices.

There were concerns that using this level of technology would complicate the process and slow down the workshop, however, that did not seem to be the case and participants' feedback indicated that it was, in fact, a positive element if not the program highlight.

Focus Group Discussions:

1. *What information would be most helpful to you in an LID manual?*

Participants indicated that information on BMP's, site conditions, maintenance, and case studies were most important for the manual's content. Other topics and issues were identified and noted, however, the topics of most importance were those that were identified multiple times and consistently at each focus group, indicating that these are the topics that sparked discussion and debate amongst focus group participants. These topics were of most concern across a wide spectrum of diverse groups in the three geographic regions and addressing them should be of prime importance in the initial draft attempt of the LID manual.

2. *How would you use an LID manual?*

Focus group participants noted that the manual's use would be primarily for education and guidance. Education of homeowners, officials, and staff were noted as uses for the manual and guidance of regulations, development, policy, and enforcement were also uses identified by focus groups of each meeting.

3. *Which organization of manual content would make it most user friendly for you? Consider the manuals presented today?*

All focus group participants indicated that the manual's organization should be based on the audience type. Each section should be designed to address the specific needs and concerns of each manual audience. This allows the manual's users to easily find the information that is most useful to them.

Survey Summary

The complete data set from the survey can be found in Appendix G. The survey was completed by 136 respondents, though respondents may have skipped questions within. Figure 11 shows the diversity of those who responded to the survey. Note that representatives from the real estate industry are the one group that is absent.

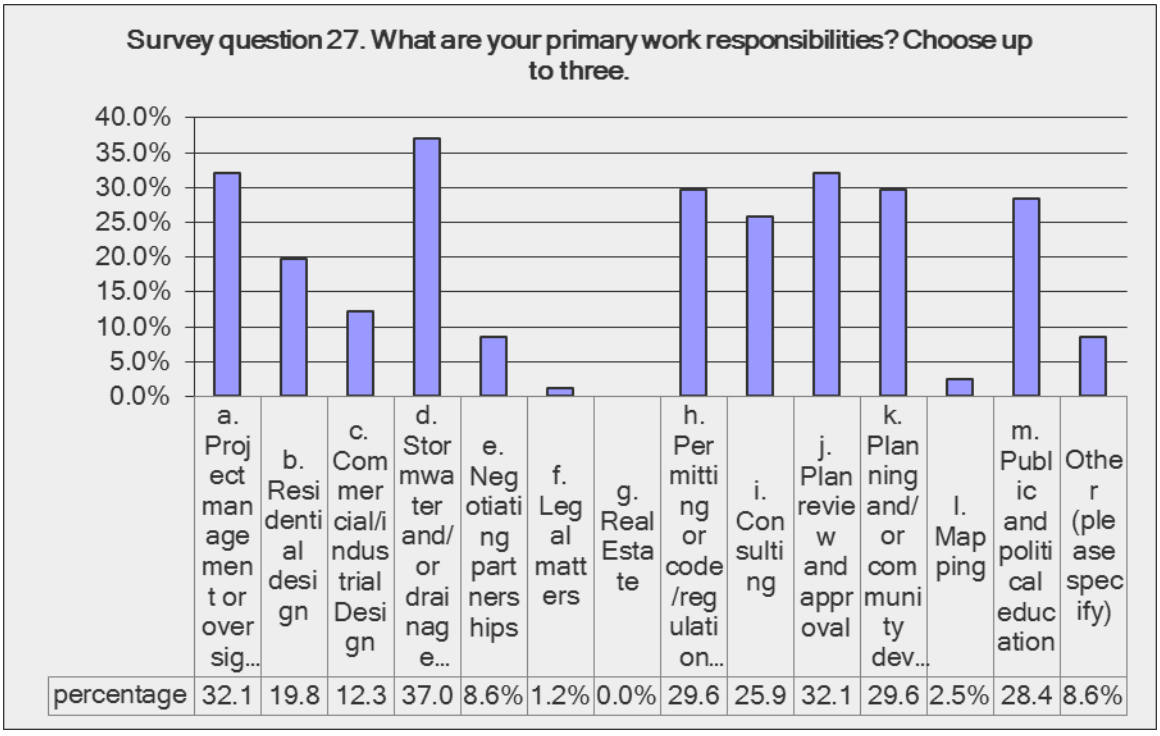

Figure 11: Survey respondent's primary job responsibilities.

Over half (53.7%) of the respondents (81) to a question about current knowledge of LID indicated that they were aware of LID concepts. There were no respondents that

indicated they had no knowledge of LID. The results indicated, however, that stakeholders have a mix of experience with LID which can be explained by how relatively new this style of development is.

From the focus group discussions the survey questions were developed. Since participants commented on such a wide range of topics and concerns, a list of topics was presented in the survey and respondents were asked to choose all the topics that would be applicable to an LID manual. Table 2 shows the topics that respondents were asked to choose from in identifying the topics that are important for inclusion in the manual.

Table 2: List of topics placed in order from most important to least.

Prioritized Topic List	Percentage Chosen
1. Design specs	77.2%
2. Case studies/examples	73.3%
3. Checklists	71.3%
4. Maintenance	67.3%
5. Cost information	60.4%
6. Performance standards	60.4%
7. Calculations/spreadsheet tool	59.4%
8. Information specific to Infill/retrofits	52.5%
9. Installation	52.5%
10. Construction	47.5%
11. Model ordinance	47.5%
12. Enforcement/inspection	45.5%
13. Planning process	44.6%
14. Education/outreach materials	36.6%
15. Other (please specify)	8.9%

As previously noted, BMPs were identified by focus group participants as a topic that would certainly be included in an LID manual. Respondents to the survey were asked several questions regarding BMPs to discover what specifically manual users will need in

terms of BMP information. First, it was asked what they need the most guidance on concerning BMPs. Design, maintenance, and performance standards were in the majority, but all the options received high attention indicating that perhaps an "all of the above" option might have been a prudent inclusion. Information that should be devoted to a section on BMP construction is timing (phasing), installation, and maintenance. A table of BMPs should include, according to the survey results, information on performance, cost, and installation (see Figures 13, 18, & 22 in Appendix G).

From the results of the workshop keypad polling session a working definition of LID was developed: "An approach to land development that uses various land planning, design practices, and techniques to simultaneously conserve natural hydrology, protect natural resource quality, and restore natural watershed functions." This was then presented in the survey and survey takers were asked if it addressed the major issues of LID as they understood it. Over 80% of the survey takers felt that the definition of LID provided addressed the major aspects of LID. Those who felt that it was inadequate focused their suggestions on wording and placing emphasis on LID design within the definition (see Figure 14 in Appendix G).

Focus group data pointed to the need for spreadsheets and checklists within the manual. However, little information was provided as to the content of spreadsheets or the focus of checklists in the manual. An open ended question was included in the survey providing survey takers an opportunity to list specific calculations that would be useful in spreadsheet format (see Figure 16 in Appendix G). As well a short list of sample checklists was provided and survey takers were asked to choose all the options that would

be useful (see Figure 17 in Appendix G). The survey revealed that spreadsheets should focus on BMPs, design, and performance. 11 of the 59 survey respondents, a mere 18.6%, to this question noted that they did not see a need for spreadsheet calculations. As for checklists, respondents noted that planning, design, and maintenance checklists would be most useful. Again, all options did receive high attention and therefore an "all of the above" option might have been utilized here. The selection of all the choices gives little guidance on the direction that checklists should go since it is unclear if there were options not present that would have been chosen had they been presented. However, the "other" category had a low response count, suggesting that only the options presented seemed most important.

During the workshops there was a great deal of discussion regarding education and outreach, with developers, public officials, homeowners and HOAs noted as the groups that need this information. The survey included open ended questions concerning the needs of each of these groups in terms of education (see Figures 24a-24c in Appendix G). Survey data indicated that an education section for developers would best be designed with a heavy emphasis on costs, a section for public officials should have overall benefits as an emphasis, and a section on education for homeowners and HOAs should keep maintenance and long term quality of life in mind. When asked what other audiences should be addressed in the education and outreach section responses focused on those in the construction industry such as contractors and installers, engineers involved in designing and monitoring LID systems, and, surprisingly, children in k-12 education programs.

LID implementation barriers and obstacles were identified as maintenance, education, and performance standards. The lack of guidance on what maintenance is required for specific BMPs coupled with the uncertainty of whose responsibility it is to maintain the LID is a major barrier. Since LID is still in its infancy, education of the various stakeholders is a concern. According to the stakeholders that were surveyed, education is a crucial first step. Lastly, the development of uniform performance standards for various BMPs would help to overcome current obstacles as seen by the stakeholders represented in the survey data. When asked what barriers specifically prevented respondents from incorporating LID in their work, they noted monetary concerns, maintenance concerns, and lack of clear guidelines as the prominent obstacles, as shown in Table 3 below. Generally the participants were divided between "yes" and "maybe" as to whether an LID manual would help to overcome any of these barriers (see Figure 27 in Appendix G). While only 1.2% (one person) of the 83 respondents to this question said that "no" an LID manual would not help.

In an effort to determine what barriers exist to implementing LID survey takers were asked if their communities had conducted a review of ordinances or developed a process to determine the barriers to implementing LID. Responses were generally split into thirds, between "yes," "no," and "I don't know." However, of those who said "no" or "I don't know" most felt that conducting a review would make implementing LID easier or encourage the adoption of LID (see Figures 28 & 29 in Appendix G).

Table 3: List of Prioritized Obstacles to LID.

List of Obstacles	Percentage Chosen
Monetary concerns (price or lack of information on costs)	56.0%
Maintenance concerns	48.8%
Lack of clear guidelines	39.3%
Site constraints (topography, soil, space)	38.1%
Lack of education/experience of clients and/or colleagues	38.1%
Disconnect between design, construction, and performance	36.9%
Lack of personal education/experience	35.7%
Lack of political will	33.3%
Limited examples and case studies	32.1%
General public acceptance	29.8%
State or local permitting and review standards	28.6%
Narrow focus/lack of landscape or watershed perspective	25.0%
Time	15.5%
Other (please specify)	11.9%

There were several questions regarding what incentives and information would aid in the implementation of LID practices. First, the results showed that credits for stormwater reduction would be the most likely incentive to get LID adopted. Examples of these credits would be higher density allowances, tax credits, or expedited permitting. Beyond incentives specific model ordinances are the most helpful tool in incorporating LID into local policy. Site conditions were chosen as the most likely first consideration in the LID planning process which suggests that providing information on site condition analysis is important to the planners reviewing LID projects.

Equally as important as identifying the manual's content is identifying its intended use and application. Over half of the responses to the question of the manual's intended use revolved around guidance, identifying incentives, education and outreach, and conservation efforts. Guidance was a common theme identified in focus groups and in survey responses. Survey takers were asked to choose from among several guidance topics (see Figure 31 in Appendix G). The specific areas that stakeholders feel they need guidance on are BMP design and selection, costs, regulations, and ordinances. A wide range of audience groups has been represented through participation and alluded to in survey responses, with primary audiences being planners, engineers, and developers.

The manual can be formatted a number of ways, and no one format is wrong. However, each format will not be effective in each of the coastal geographic areas. The survey inquired about the format that would be most effective for coastal South Carolina. Several of the more important topics noted by coastal workshop participants were, case studies, costs, and graphics. Case studies should certainly be included in the manual and most survey respondents feel that case studies should be placed within or at the end of each applicable chapter.

Stakeholders were asked to choose the two most important considerations when looking at case studies, but unfortunately there was an error in the question reporting, leaving participants only able to choose one option. Some respondents chose only one option while others chose to write in their two choices in the "other" category. Despite the glitch in reporting, responses that the survey was able to capture clearly define "site conditions" as the largest concern when considering case studies. Furthermore, because

of the error in reporting, the results for this question should be viewed as suggestive at best and warrants exploration into the considerations for case studies. Figures 34 and 35 in Appendix G show the results for both the original data and the data after being corrected for the error in reporting.

Though, participants have been mixed as to how costs should be presented, responses are mostly concentrated on separating costs out into each applicable section or chapter. Lastly, the use of graphics would be desirable in sections on site condition considerations, BMP design, and in the presentation of case studies. Graphics should be included wherever possible to simplify concepts.

Discussion

The variation seen in the job duties of both workshop and survey research subjects indicates that the results of the study are comprehensive and applicable. The absence of participation by members of the real estate industries could be explained by a gap in the participant search process, or a lack of concern among real estate professionals for issues addressed by LID. In either case they were not identified as a primary audience for a South Carolina coastal LID manual in either the focus group discussions or in the survey and therefore their lack of input seems to impact the utility of the results very little.

Content

Based on the results of the workshops and survey, a clear directive has emerged for the development of a South Carolina coastal LID manual. The goal of the project was to identify the content, use, and format that are most appropriate for this manual. It was

made clear early on by participants that the content of the manual should be organized according to audience type focusing on the content needs of specific stakeholders The survey results narrow the focus to just a few topics of common concern.

The first topic of concern is best management practices (BMPs), which should be organized in a spreadsheet format that includes a comparison of each BMP's performance standard, maintenance regimen, associated costs, installation procedure, practical design, and project timing or phasing. The top five topics as represented in the survey data are (in order from most important to least) design specifications, case studies, checklists, information on maintenance, and information on costs. Checklists were noted as being useful if designed for use in the LID planning process, design process, or maintenance regimen.

Education and outreach should be contained in the manual and developers, public officials, and homeowners and HOAs should be the focus of this section. The survey helped to affirm some logical predictions about the content of an education section developed for each of these groups. For instance the survey results showed that stakeholders felt that developers would need education on the costs and cost-benefit analysis associated with LID projects, which could be assumed since economics undoubtedly play a large role in shaping developers' decisions. An education section dedicated to public officials should be focused on the presentation of LID benefits. This will assist in establishing support for LID policy that public officials develop and propose for specific areas given the ecology of that area of application. Lastly homeowners and HOAs should get an education section dedicated to the maintenance of LID since they are

stakeholders with a long term vested interest. Having the information that allows one to properly maintain or contract to have maintained vital LID features is in the long term interest of the land owner and will ultimately conserve valuable resources.

There will always be barriers and obstacles to implementing any new policy or practice so it comes as no surprise that many of the topics identified as important resurfaced when asked what obstacles and barriers exist. Cost, maintenance, performance, and education and guidance were all noted as topics that present obstacles or barriers to implementation of LID practices or adoption of LID policies. Many of the obstacles and concerns can be addressed through the effective education and conveyance of the manual's purpose and content. The survey did detect that some communities which had not conducted a review of their ordinances or barriers to LID would benefit from having model ordinances and information on LID policy. The manual should include a guide to conducting a community review for the foundation of an ordinance review as well as a model ordinance to guide policy formation. The manual should also include guides to appropriate incentives and credits that will encourage LID community wider acceptance.

Use

The manual is intended to be used by a number of groups and each will have a different motive and intent when referencing the manual. The manual's main use will be as a guidance tool offering direction on issues of policy, planning, and design for construction and development. Stakeholders will use the manual to identify benefits of LID, educate themselves or others, and gain support for conservation efforts. The

manual's use largely dictates what material will be included as well as how that material is presented. Since the manual will be used primarily as a guidance measure, then its format should be highly organized in a manner that is easily navigated by both the technical professional as well as the non-technical user.

Format

While the general format of the manual was identified early in the planning process as audience driven, the specific format of the more detailed information needed expanding upon. For instance, how should costs be displayed? Some feel as though they should be organized into spreadsheets in the appendix for fast and easy calculations while most feel that costs are best suited placed in the manual only where appropriate to the material. Similarly case studies should be placed in or at the end of each applicable chapter. Case studies are to be included to provide examples and context for LID projects currently under consideration and construction.

LID project timing and audience group seem to follow one another closely, as LID project phases change so does the group of stakeholders that are involved. That leads to the conclusion that the manual's ultimate format would be most useful to the user if both project phase and appropriate audience were coupled (see Appendix H for a sample table of contents).

Lastly graphics should be placed in wherever they will assist in understanding the purpose and function of a provision and to simplify the concepts being presented. Graphics include pictures, drawings and diagrams, blueprints, renderings, and any other visual aid that is used to support material within the manual narrative. Site condition

considerations, BMP design, and the presentation of case studies are the areas of the manual that respondents feel they would benefit the most from the integration of graphics.

Future Research

The efforts of this project were concentrated on the South Carolina coastal communities. A continuation of this research could focus on determining the needs of South Carolina as a whole. Additionally it would be very useful to the ACE Basin CTP, the project's many partners, and the social science community, to do a post implementation review of the final South Carolina coastal LID manual. Being able to gauge the performance of the LID workshops, focus groups, and survey would be a valuable exercise in qualitative research evaluation. Further research could determine if development projects within coastal communities of South Carolina incorporated LID principles after the publication of the manual. Granted, however, effects from the implementation of the principles and policies set forth in the LID manual could take years to have measurable results.

Conclusion

The ACE Basin CTP and its partners successfully administered various sessions for input, review, and trainings that inform participants of recent regional LID manuals and their development, use, and effectiveness. This includes gaining a common working knowledge of the general community policy makers and stakeholders' understanding and support for the concept encompassed in the phrase "Low Impact Development." Using computer surveys, personal contact at workshops in various locations, and implementing

keypad polling, the study participants became actively involved in the SC LID manual development process and began to feel ownership in the final product. Sharing information about the needs for the content and use of an LID manual will be the last step in the policy transformation process.

From the meetings I was able to get a broad view of what topics and issues are of most concern to the decision makers and stakeholders on the coast of South Carolina. Facilitated focus groups aided in the information transfer, where participants learned about LID long term and short term benefits. The survey, developed from the data collected in the focus groups, delved deep into the mind of coastal decision makers to discover in what areas they require the most guidance and what areas of LID are the most important for them.

From the data it is clear that stakeholders want and need a manual that has ample background information as well as technical guidance. Stakeholders would like to see a manual that addresses the needs of each respective stakeholder group individually. Providing the document in a digital format would also meet the need of the modern coastal decision maker, who often needs to access data quickly and sort through it to find just the appropriate information for whatever purpose is necessary. Ultimately it is the participants and the groups that they represent that will use this manual and it is only fitting that they be the ones who define what it is.

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Appendices

Appendix A: Workshop Announcement

An information exchange for decision makers:

South Carolina Coastal Low Impact Development (LID) Manual: Needs, Use and Lessons Learned

South Carolina is developing a Coastal LID Manual and needs your help! Mark your calendar to attend the **Coastal LID Manual Meeting** in your region. **Low impact development** describes an innovative approach to site development and stormwater management that aims to minimize impacts to the land, water, and air, while reducing infrastructure and maintenance costs and increasing marketability.

The meeting is designed to inform participants of current, regionally significant LID manuals from neighboring states and gather input as to the appropriate content of a South Carolina coastal specific LID manual. The meeting will lay out barriers to development of an LID manual as well as effective practices and policies as seen through specific case studies. Participants will be asked to provide insight from their perspectives on what would be useful for their professional duties. This input is vitally important to creating an effective, accepted, and comprehensive manual.

Participation in the full day of meeting activities ensures that input is received. **AICP, PDH**, and **continuing education** credits through the SC Planning Education Advisory Committee will be available to those who participate in the full meeting.

When and Where: 9:00 AM-3:30 PM
January 10th at Coastal Carolina University in Conway, SC
January 11th at Clemson Coastal Research and Education Center Charleston, SC
January 12th at Technical College of the Lowcountry in Beaufort, SC

Who: Planners, elected and appointed officials, developers, engineers, municipal staff, consultants, stormwater managers and agency staff

Online registration at: http://www.surveymonkey.com/s/sclidmanual
More information and resources are available at:
http://www.dnr.sc.gov/marine/NERR/traininglidmanual.html

Agenda

8:30-Registration

9:00-Welcome and Introductions

9:15-North Carolina LID Manual: Content, Use and Lessons Learned

10:00-Break

10:15-Georgia Green Growth Guidelines: Content, Use and Lessons Learned

11:00-Georgia Stormwater Supplement: Content, Use and Lessons Learned

11:45-Keypad Polling for SC Content and Use

12:00-Lunch (provided)

1:00-Watershed LID Activity

1:30-Breakout Discussions for SC Content and Use

3:00-Keypad Polling for Wrap Up

3:30-Evaluations and Adjourn

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Appendix B: Process agenda including keypad polling questions and meeting objectives.

LID manual stakeholder input meetings

January 10-12, 2011

Conway, Charleston, Beaufort SC

Meeting Objectives

Participants will…

- be informed of recent regional LID manuals and their development, use, and effectiveness
- gain a common working knowledge of the phrase "Low Impact Development," through the use of keypad polling
- become actively involved in the SC LID manual development process and begin to feel ownership in the final product
- share information about their needs for the content and use of a SC LID manual

Time	Activity	Materials and presenters/facilitators
8:30 – 9:00	**Registration** Provide agenda, evaluation, participant list, name tags Coffee and water provided	
9:00 – 9:15	**Welcoming remarks, goals of the day** Review objectives for the day, point out participant list and highlight types of attendees in the room, housekeeping remarks	Karen Fuss (Conway) Dave Joyner (Chas) Becky Walker (Beauft)

	total time: 15 minutes	
9:15 – 9:55	**SC LID update and next steps** Objective: Participants will be informed of recent regional LID manuals and their development, use, and effectiveness • Presentation (30 min) • Questions and answers (10 min) **total time: 40 min**	Lisa Vandiver Powerpoint projector Remote control
9:55 – 10:35	**NC LID manual: content, use, lessons learned** Objective: Participants will be informed of recent regional LID manuals and their development, use, and effectiveness • Presentation (30 min) • Questions and answers (10 min) **total time: 40 min**	Christy Perrin Powerpoint projector Remote control

10:35 – 10:50	**BREAK**	

10:50 – 11:45	**Georgia Green Growth Guidelines and Coastal Stormwater Supplement: Content, Use and Lessons Learned** Objective: Participants will be informed of recent regional LID manuals and their development, use, and effectiveness • Presentation (40 min) • Questions and answers (15 min) **total time: 55 min**	Tara Merrill, Courtney Reich, David Briglio Powerpoint projector Remote control
11:45 – 12:00	**Keypad Polling: SC LID manual content and use** Objective: Participants will gain a common working knowledge of the phrase "Low Impact Development" 1. Which of the following best describes you job duties? a. Planner or planning staff b. Developer c. Stormwater staff d. Engineer e. Architect f. Regulator g. Consultant	Becky Walker Keypads receiver

	h. Other 2. Which of the following best defines Low Impact Development? If some but not all of the definitions seem acceptable, choose the one you feel is best. [afterwards say: Mark on the sheet provided all definitions that seem appropriate and write in any additional points not captured.] a. A land planning and engineering design approach to managing stormwater runoff. b. A sustainable landscaping approach that can be used to replicate or restore natural watershed functions and/or address targeted watershed goals and objectives. c. The practice of using techniques in building and construction that minimize the effect that development will have on the quality of the surrounding environment. d. An approach to land development that uses various land planning and design practices and technologies to simultaneously conserve and protect natural resource systems and reduce infrastructure costs. e. A development that has less impact on the environment than a traditional development. f. All of the Above 3. Would you consider stormwater control an aspect of LID? a. Yes b. No 4. Would you consider minimizing impact on the natural environment to be an objective of LID?	

	a. Yes b. No 5. Are a site's natural hydrology and pre-development conditions considerations when implementing LID practices? a. Yes b. No 6. Are building strategies that minimize energy consumption an aspect of LID? a. Yes b. No 7. Is development with low density indicative of LID? a. Yes b. No 8. How would you characterize your current experience with LID? a. Well developed knowledge and experience b. Some experience and limited knowledge c. No experience and limited knowledge d. No previous experience or knowledge **total time: 15 minutes**	
12:00 – 1:00	**LUNCH**	
1:00 – 1:15	**Focus Group Instructions** • Tell participants which group they are in, where they are meeting • Remind them how focus group info will be used, and that all will reconvene for a report-out at 3:00 • Move to focus groups in time to begin at 1:15 **total time: 15 minutes**	CSC facilitator

1:15 – 1:35	**Focus group introductions** • Round the room, name and your role in LID • Select report-out reporter **total time: 20 min**	Conway and Chas: 2 CSC facil plus Becky and notetaker Beaufort: 3 CSC facil and notetaker Laptop for notetakers Flip charts Easels markers
1:35 – 2:55	**Focus group activity** <u>Objective</u>: Participants will become actively involved in the SC LID manual development process and begin to feel ownership in the final product • Discussion questions: **1.** What information would be most helpful to you in an LID manual? a. Information for home owners and	Conway and Chas: 2 CSC facil plus Becky and notetaker Beaufort: 3 CSC facil and notetaker

	developers b. Specific case studies of LID implementation c. Model ordinances and regulations d. Information on construction designs and planning with a Lowcountry focus e. Information on street, parking, and transportation system designs f. Examples of stormwater management practices including Best Management Practices (BMPs) g. Information on economic and/or social impacts h. Benefits and barriers to implementation of LID practices and policies including Design issues in Coastal SC i. Information about the local Hydrologic cycle j. Information on maintenance and enforcement of LID k. Information on agricultural LID l. Information on Incentive structures m. Current available LID resources **2.** How would you use an LID manual? a. To promote the use of LID practices and policies, ie: influence developers, elected officials, and engineers. b. As a guide when writing ordinances and regulations c. To identify potential areas within your jurisdiction that are available for the implementation	Laptops for notetakers Flip charts Easels markers

	of LID d. To guide the progress of ongoing projects or as a guide to influence future projects (for developers) e. As a reference when considering development options f. To set up incentive systems g. As a guide and reference for home owners and developers h. Create construction specifications and standards **3.** Which organization of manual content would make it most user friendly for you? Consider the manuals presented today. a. Should the content be organized by the end user? i.e.: residential/commercial/regulatory…. b. Should it be organized by LID topic? i.e.: model ordinances/case studies/BMPs etc… all in their own categories. c. How can it be set up so that you find what you need easily? i.e. use of an index/table of contents, color coded chapters • At end make sure a reporter is prepared to provide top two comments **total time: 1 hr 20 min**	
2:55 – 3:00	**Move back into full group**	

3:00 – 3:15	**Lightning round report-out** <u>Objective</u>: Participants will share information about their needs for the content and use of a SC LID manual. • First group is to share top 2 - Comments? Priorities? Ah-has? Favorite topics they discussed? Need to think through… (5 min) • Following groups only share something that HAS NOT been shared yet. Maximum 2 topics per group. (10 min) **total time: 15 min**	CSC facilitator
3:15 – 3:30	**SC LID next steps** • Thank participants • How this information and other 2 mtgs this week will be used • When/how they can expect to hear from us again **total time: 15 min**	Karen Fuss (Conway) Dave Joyner (Chas) Becky Walker (Beauft)

Appendix C: Keypad polling questions:

1. Which of the following best describes you job duties?
    a. Planner or planning staff
    b. Developer
    c. Stormwater staff
    d. Engineer
    e. Architect
    f. Regulator
    g. Consultant
    h. Other

2. Which of the following best defines LID? If some but not all of the definitions seem acceptable, choose the one you feel is best.

    A - A land planning and engineering design approach to managing stormwater runoff

    B - A sustainable landscape approach that can be used to replicate or restore natural watershed functions and/or address targeted watershed goals and objectives

    C - The practice of using techniques in building and construction that minimize the effect that development will have on the quality of the surrounding environment

    D - An approach to land development that uses various land planning and design practices and technologies to simultaneously conserve and protect natural resource systems and reduce infrastructure costs

    E - A development that has less impact on the environment than a traditional development

    F - All of the above

3. Would you consider stormwater control an aspect of LID?
    a. Yes
    b. No
4. Would you consider minimizing impact on the natural environment to be an objective of LID?
    a. Yes
    b. No

5. Are a site's natural hydrology and pre-development conditions considerations when implementing LID practices?
    a. Yes
    b. No
6. Are building strategies that minimize energy consumption an aspect of LID?
    a. Yes
    b. No
7. Is development with low density indicative of LID?
    a. Yes
    b. No
8. How would you characterize your current experience with LID?
    a. Well developed knowledge and experience
    b. Some experience and limited knowledge
    c. No experience and limited knowledge
    d. No previous experience or knowledge

Appendix D: Codes developed for focus groups data.

Question 1: Topics to Included	Question 2: How to Use	Question 3: Format
BMPs	Conservation	Appendix
Calculations/Spreadsheet	Demonstration	Audience driven
Case Studies/Examples	Design guide	Background/Introduction
Checklists	Education	BMP ranking
Construction	Guiding document	Case studies/Examples
Cost/Cost-Benefit/Economics	Incentives	Cost information
Credits	Information	Definition
Definition	Influence	Digital
Design	Marketing	Ecological
Education/Outreach	Planning	
Enforcement/Inspection	Political guide	Glossary
Green Roofs	Simplification	Graphics
Grey water		Outlined
Groundwater		Ordinance/code/regulation
Guidance		Performance/Standards
Incentives		Purpose/Intent/Goals
Infill/Retrofit		Regionally
Installation		Searchable
Maintenance		Simple
Model ordinance/code/regulatory		Technical
Monitoring		Uploadable
Performance/standards		
Planning Process		
Purpose		
Resources		
Site condition/soils		
Summaries		
Technical terminology		
Transportation		
Vegetation		

Appendix E: Codes developed for survey responses.

Question 5:

Context
Definitions
Design
Economic
Ecosystem Services
Enforcement
Human Aspect
Livability
Methodology
Supporting Documents
Transportation
Wording

Question 6:

No need
Design
Cost
BMPs
Performance
Quality of life
Hydrology
Model
Everything
Maintenance
Site condition

Question 8:

Graphics
Timing
Installation
Troubleshooting
Vegetation
Design guide
Site considerations
Case studies
Cost
Maintenance
Qualifications
Materials
Performance
Soils
Engineering specs
NA

Question 9:

Education
Ordinance
Benefits
NA
Maintenance
Performance standards
BMP design
Permitting
Installation
Regulatory
Communication
HOAs
Case studies

Question 14:

Developers:

Marketing
Permitting
Credits
NA
Design
Cost
Benefits
Installation
Case studies

Maintenance
Performance
Regulatory
Site conditions
Timing

Public officials:

Site Conditions
Cost
Benefits
Ordinance
Permitting
Education
Case studies
Timing
Marketing
Installation
Performance
NA
Maintenance
Enforcement
Design
Regulatory

Homeowners and HOAs:

Benefit
Case studies
Cost
Design
Installation
Maintenance
NA
Performance

Question 15:

Planners
Suppliers
Construction
Engineers
Media
Landscaping
Public
Architects
Children
Land Owners
Real Estate
Administrators
Blank
Agency
Public Works
Religious
Lenders

Appendix F: Survey Email

Recently a series of workshops, titled *South Carolina Coastal Low Impact Development (LID) Manual; Needs, Use, and lessons Learned,* were held in January in Conway, Charleston, and Beaufort, SC. The goal of the workshops was to gather input from various stakeholders and coastal decision makers about the effective, content, use, and format of a South Carolina coastal Low Impact Development (LID) manual. The workshop attendees were placed in focus groups to discuss what would be most useful for them. From that information a survey has been created aimed at gathering more detailed information about content, use, and format of a South Carolina LID manual. **It can be completed in 15 to 20 minutes and is greatly appreciated. We ask that you take a moment to complete the survey and then forward this to any colleagues that might be interested in giving input as well.** We are looking for a broad range of participation, so feel free to forward to all those you deem appropriate. The survey will be available until March 4th and can be found by following the link:
http://www.surveeymonkey.com/s/LIDcontentsurvey

Thank you in advance for your participation. If you have any questions or concerns please feel free to contact us. Also, please continue to find and use resources associated with this workshop on our website found at the link:
http://www.dnr.sc.gov/marine/NERR/traininglidmanual.html

Laurence Sutley
South Carolina Dept. of Natural Resources
NERR Coastal Training Program
SutleyL@DNR.sc.gov
843-953-9800

ACE Basin CTP's Website: http://www.dnr.sc.gov/marine/NERR/ctp.html

Appendix G: Survey Results

All but one individual that followed the link to the survey chose to complete the survey. In total 136 individuals started the survey, though not all answered every question. Questions are numbered according to how they appeared in the survey.

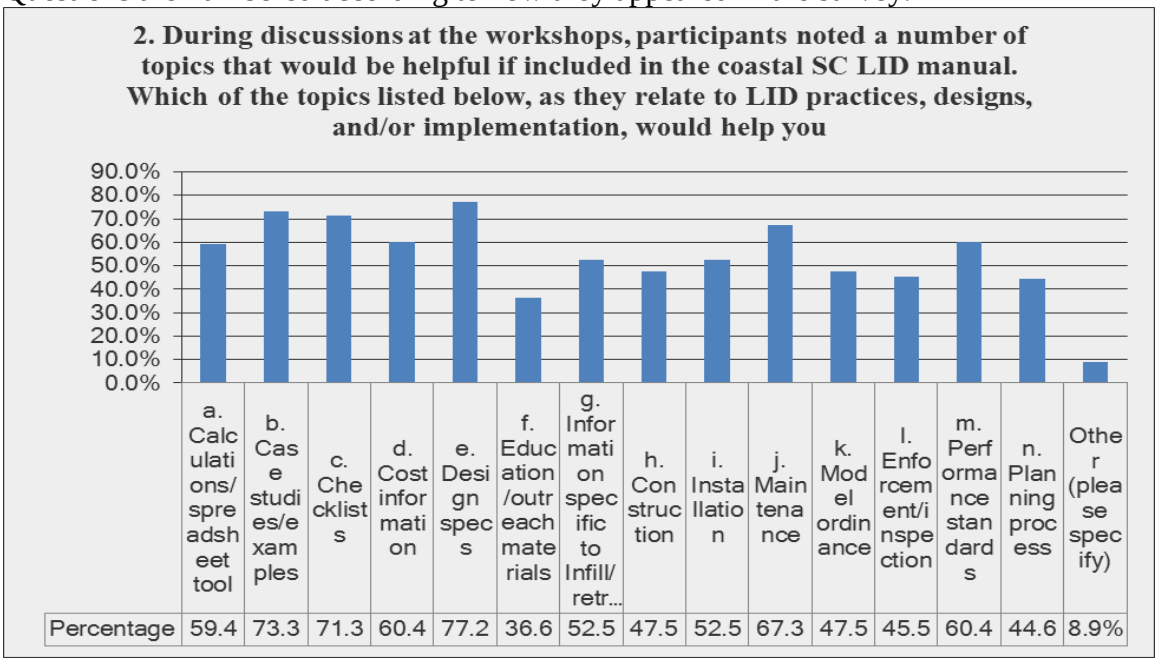

Figure 12. Percentages are based on a response count of 101.

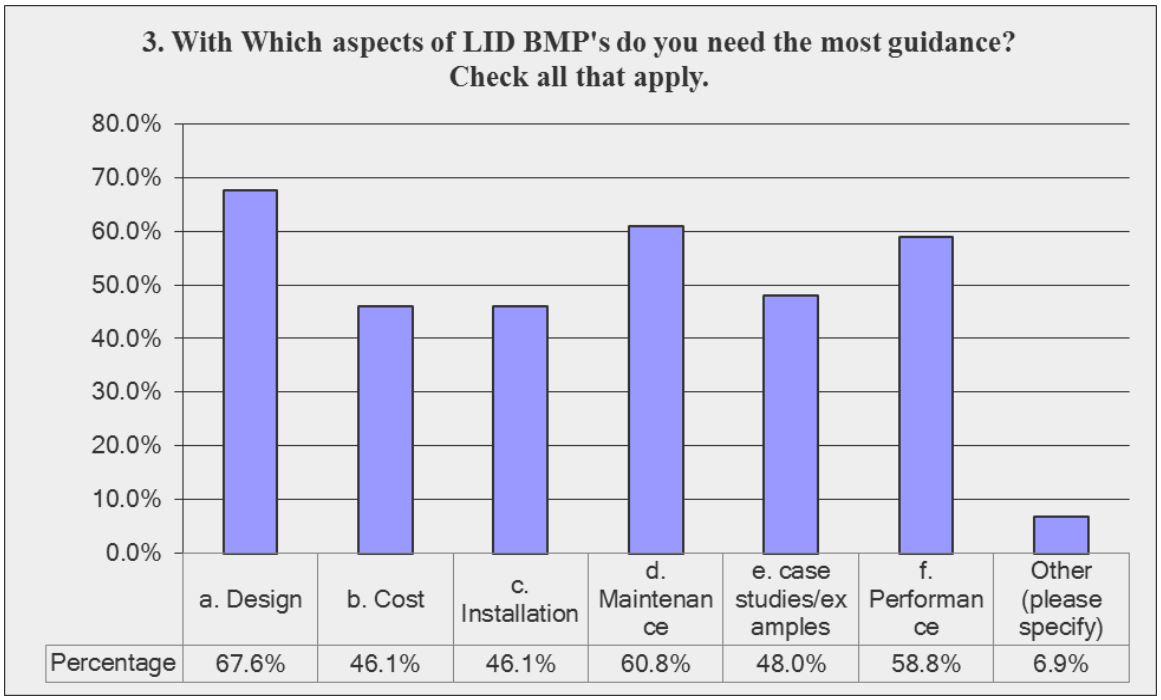

Figure 13: Percentages are based on a response count of 102.

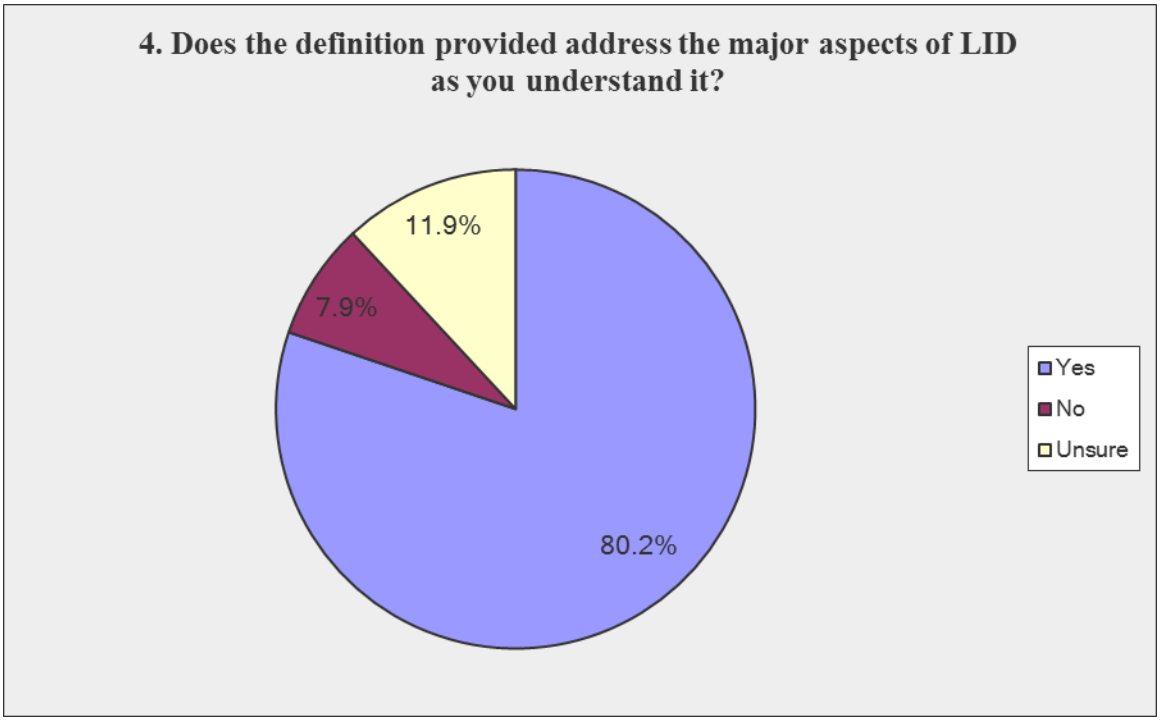

Figure 14: Percentages based on a response count of 101.

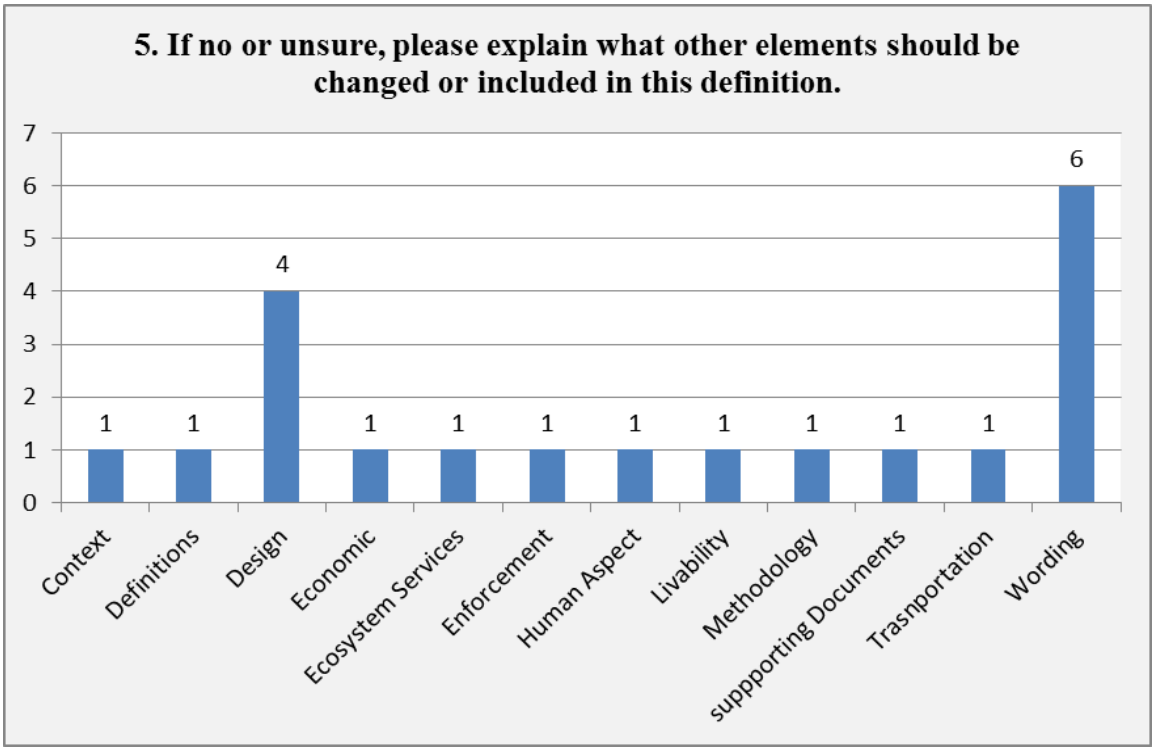

Figure 15: 20 participants gave feedback for this question. See Appendix E for list of all codes.

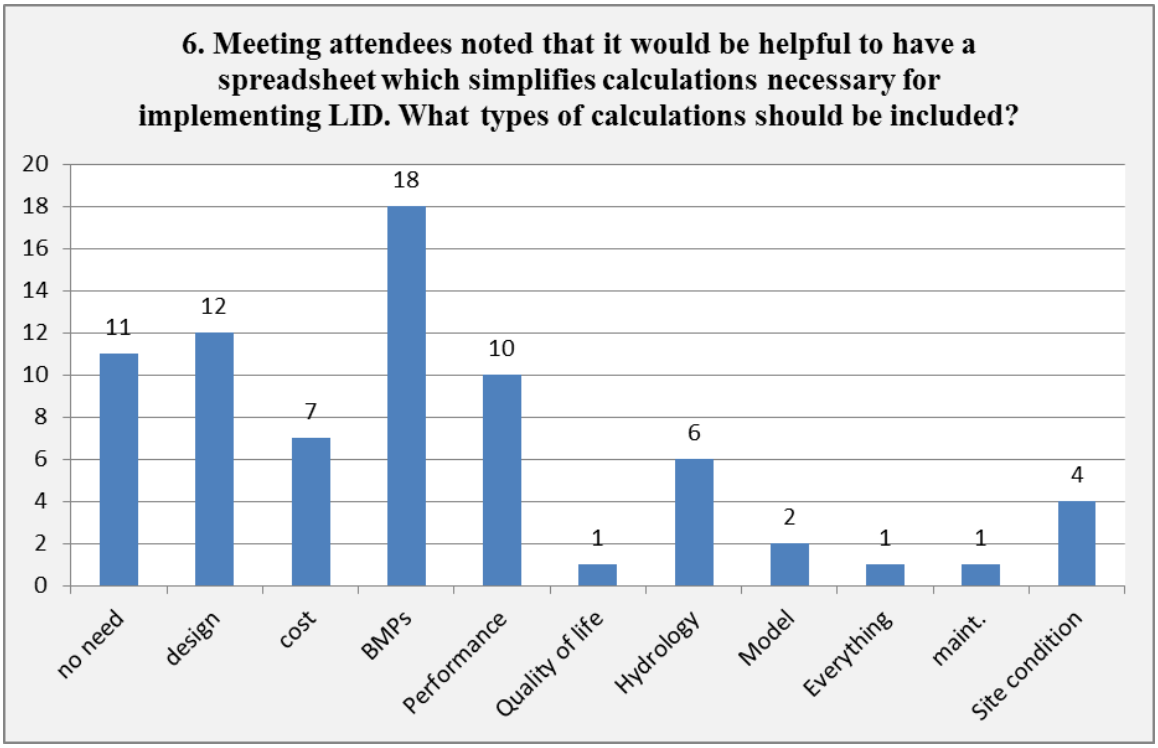

Figure 16: 59 participants gave feedback for this question. Comments could be coded for multiple codes.

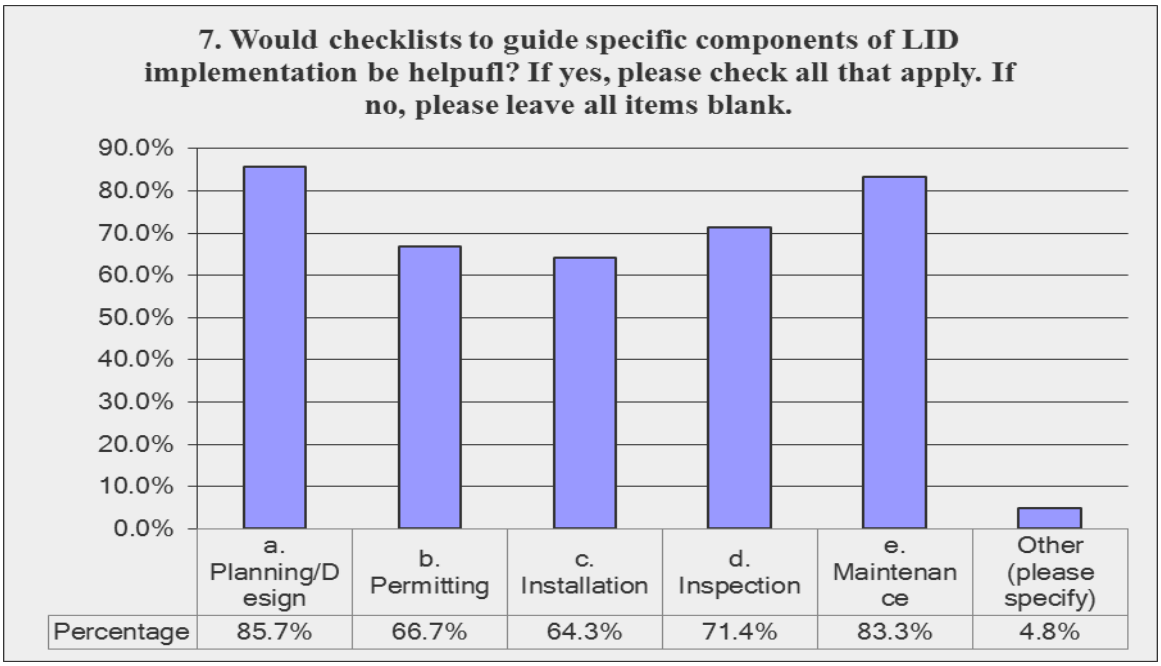

Figure 17: Percentages are based on a response count of 84. 52 respondents left this question blank.

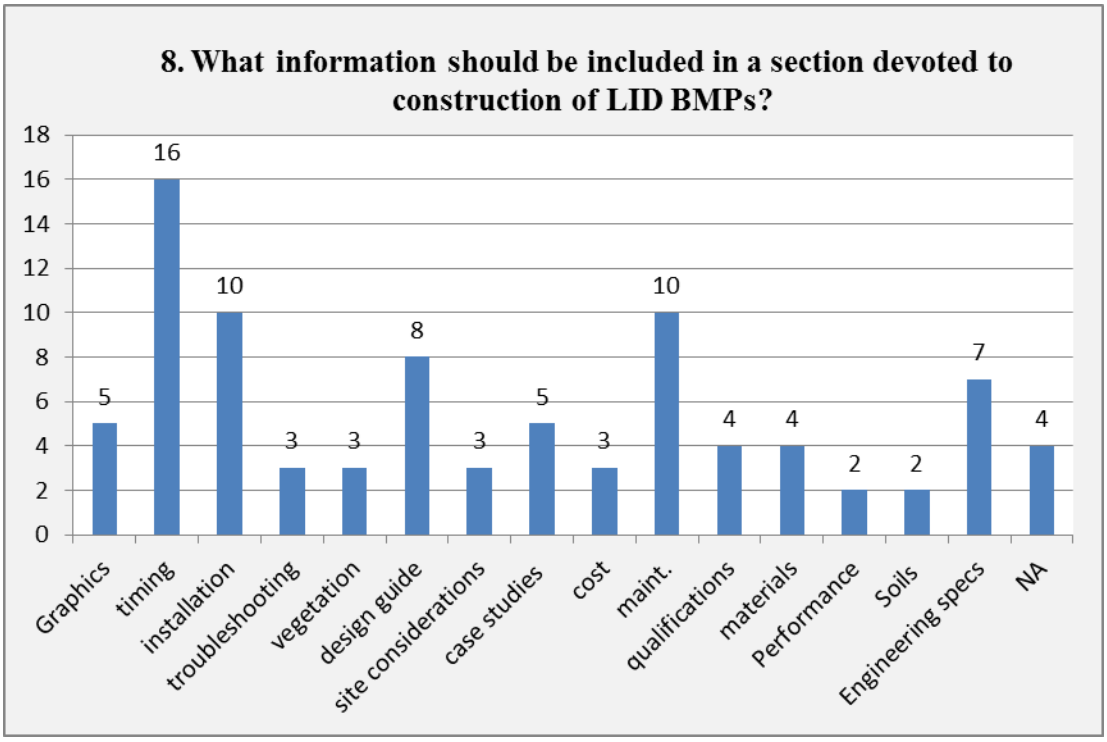

Figure 18: There were 61 responses that were coded for this question.

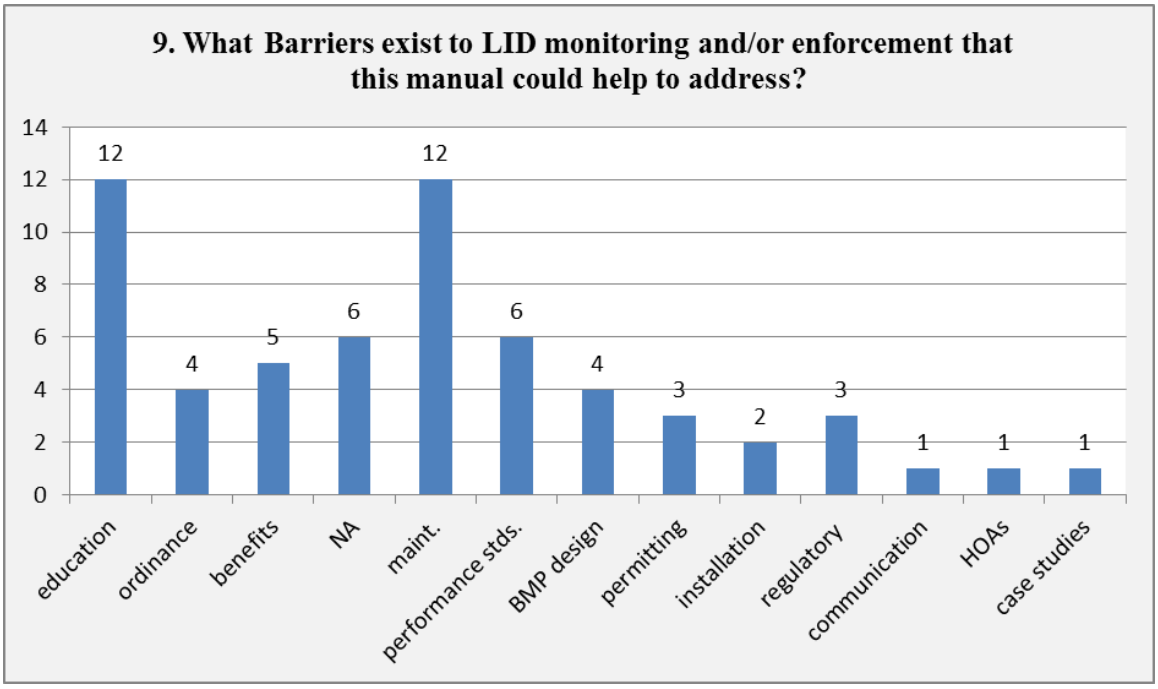

Figure 19: There were 58 responses that were coded for this question.

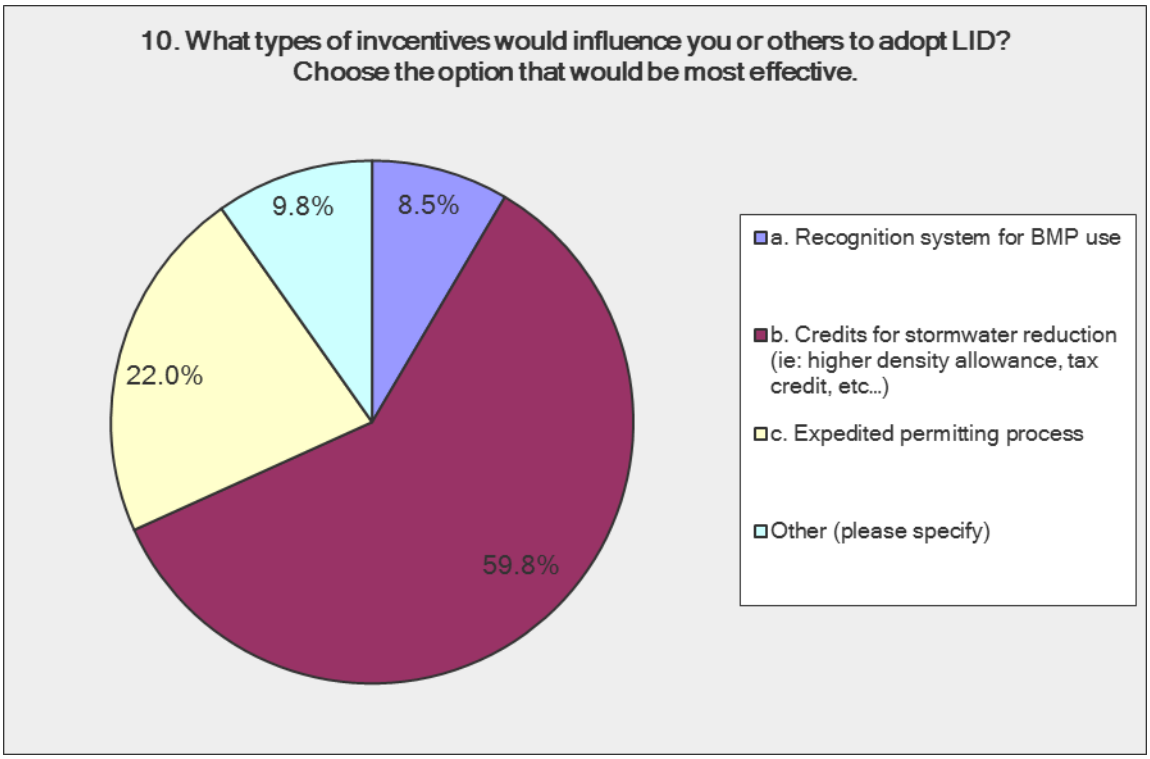

Figure 20: Percentages based on a response count of 82.

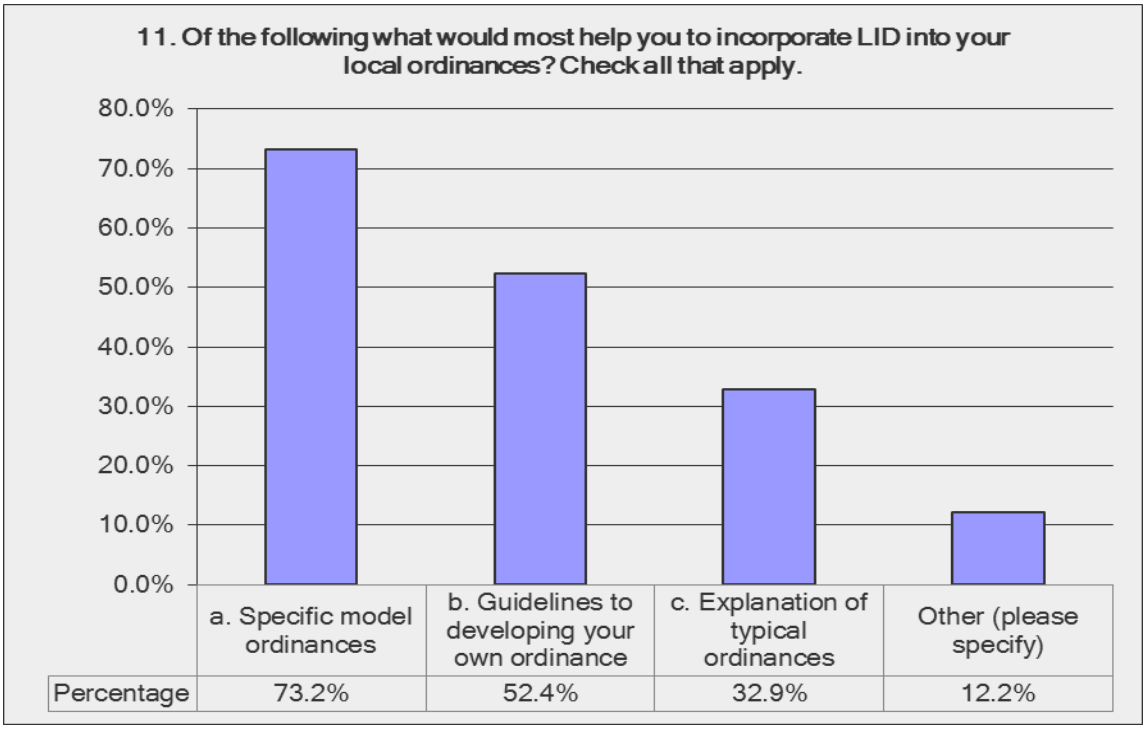

Figure 21: Percentages based on a response count of 82.

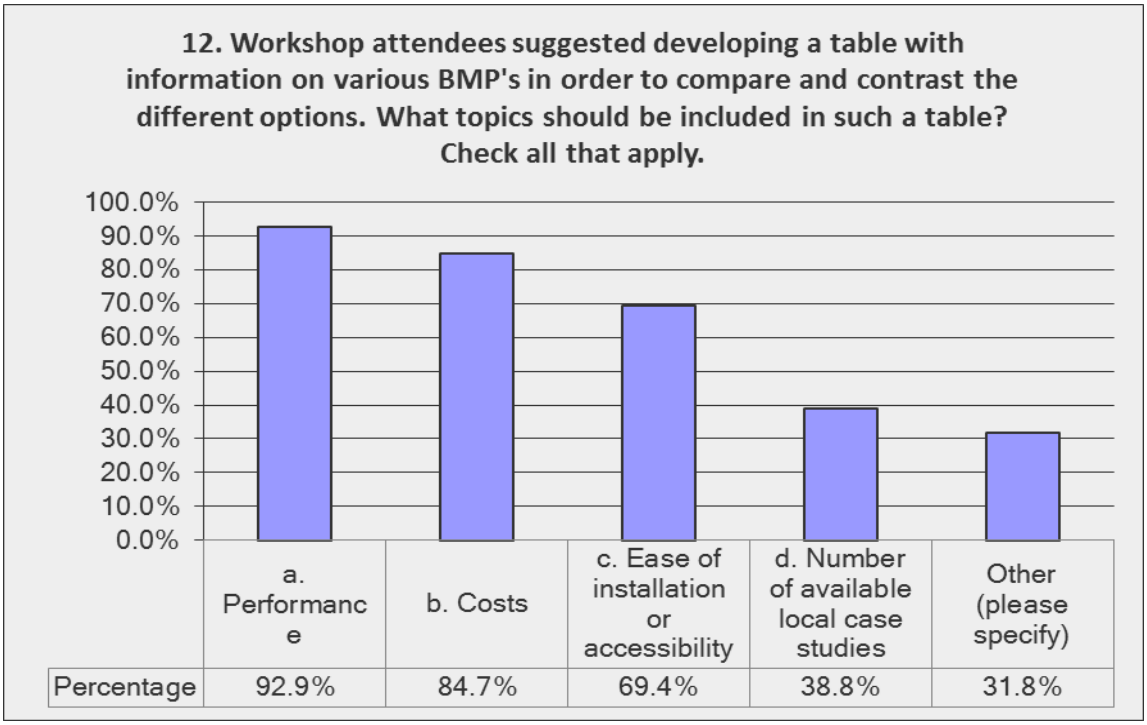

Figure 22: Percentages are based on a response count of 85.

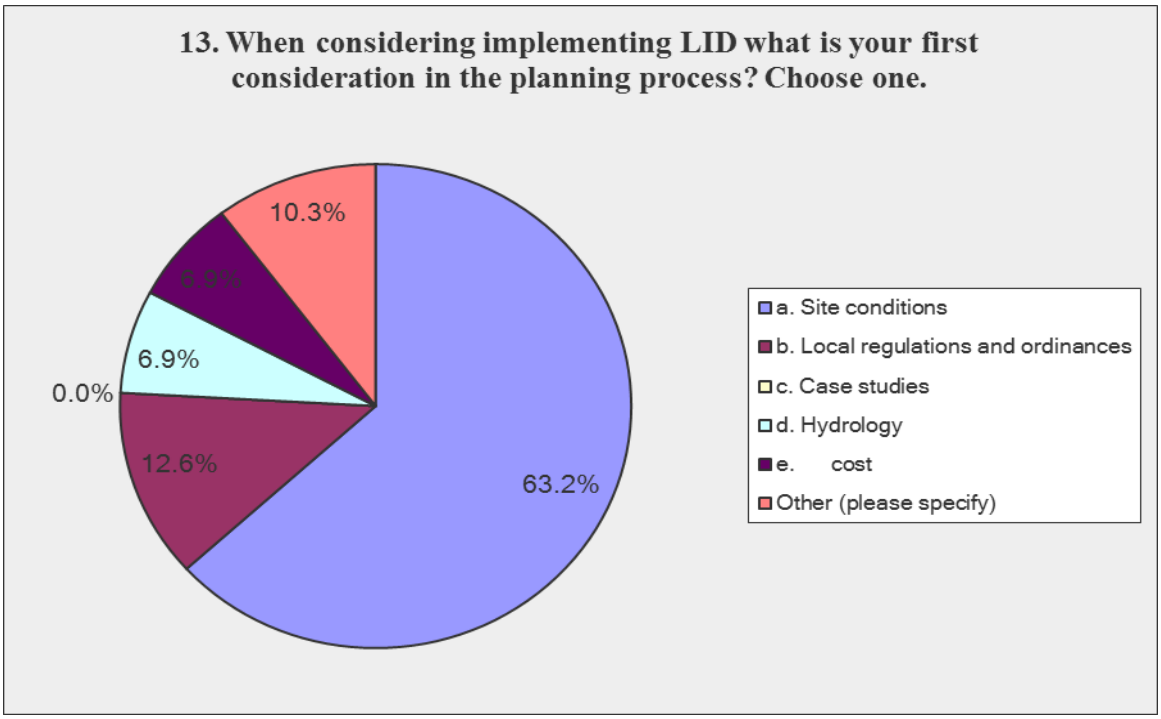

Figure 23: Percentages are based on a response count of 87.

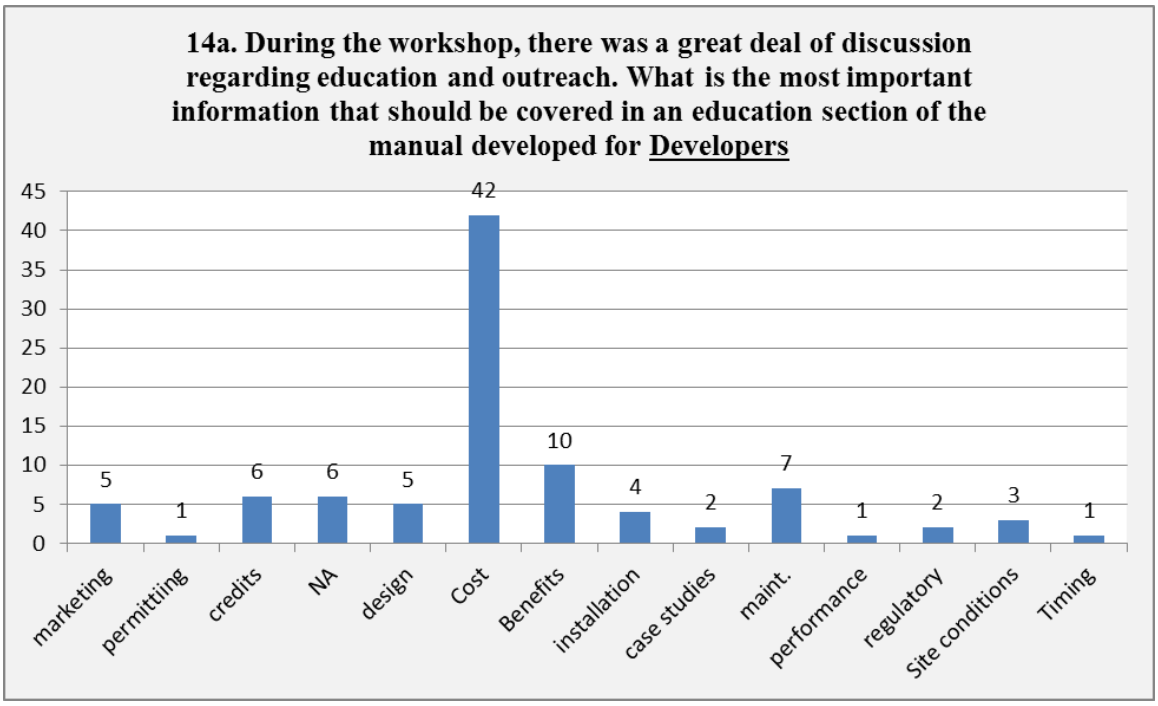

Figure 24a: Developers

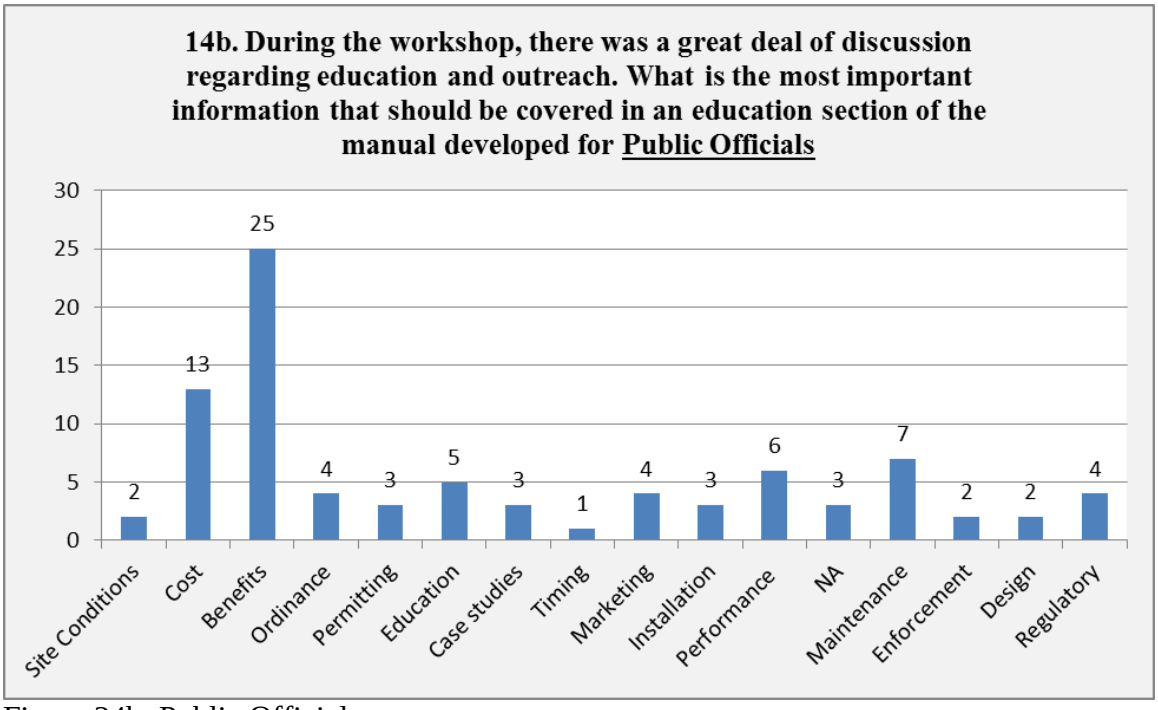

Figure 24b: Public Officials

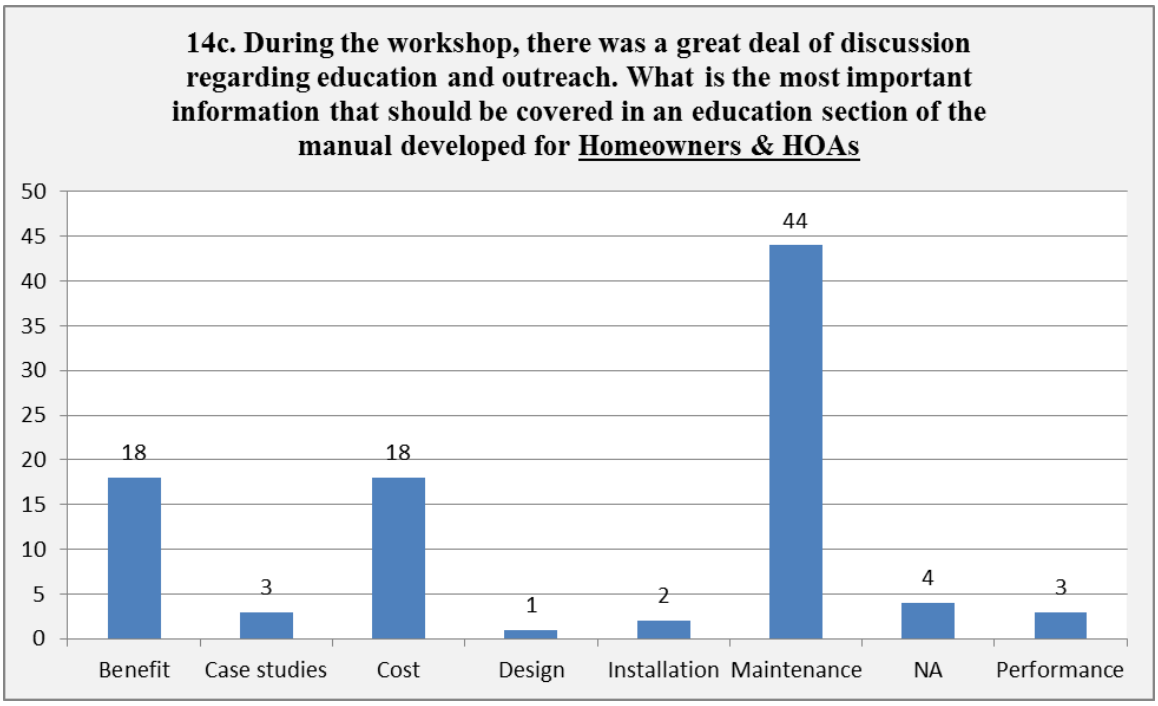

Figure 24c: Homeowners/HOAs, There were 71 responses to this question (a,b, and c combined) that were coded.

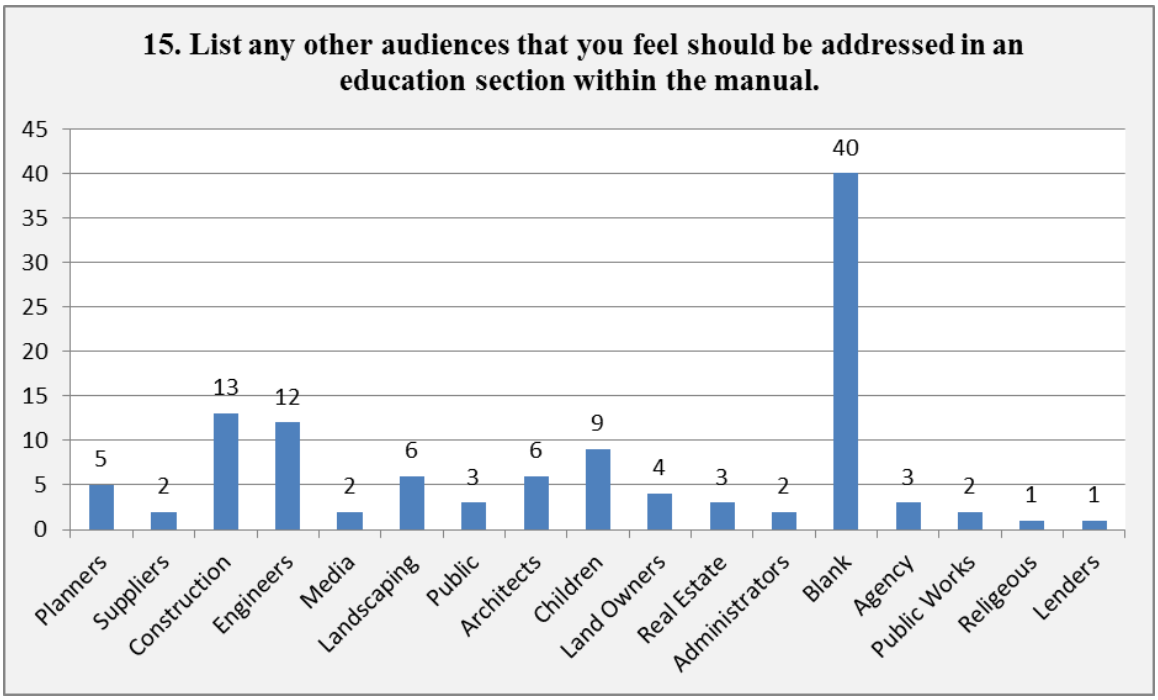

Figure 25: There were 41 responses that were coded for this question.

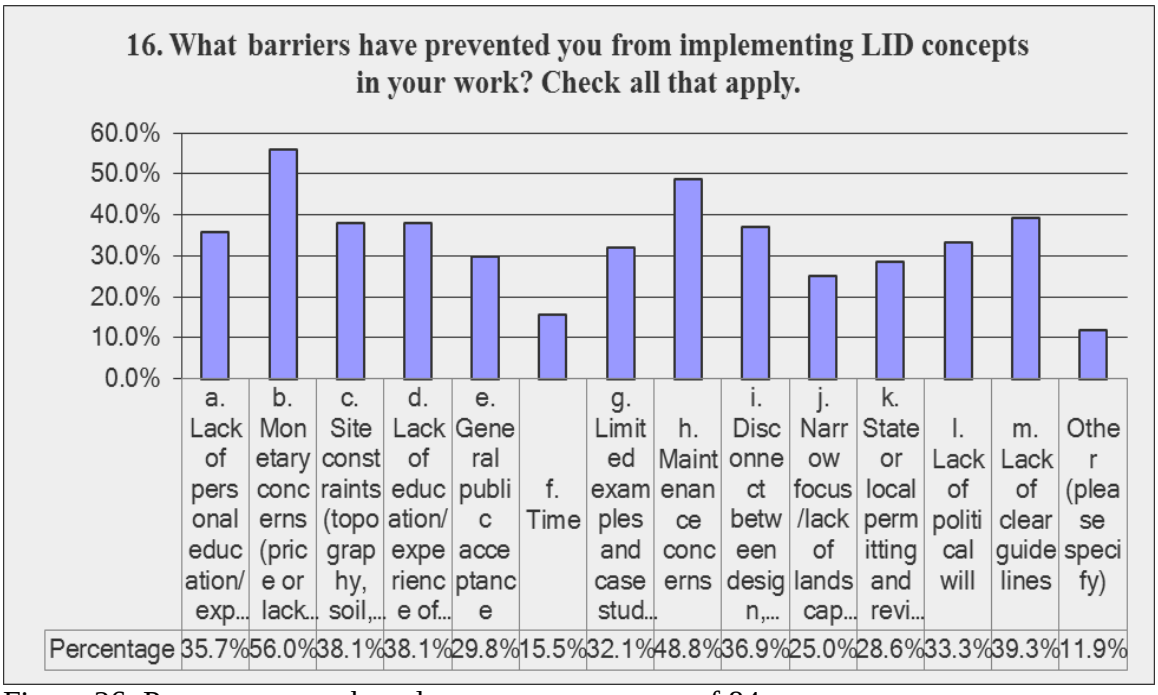

Figure 26: Percentages are based on a response count of 84.

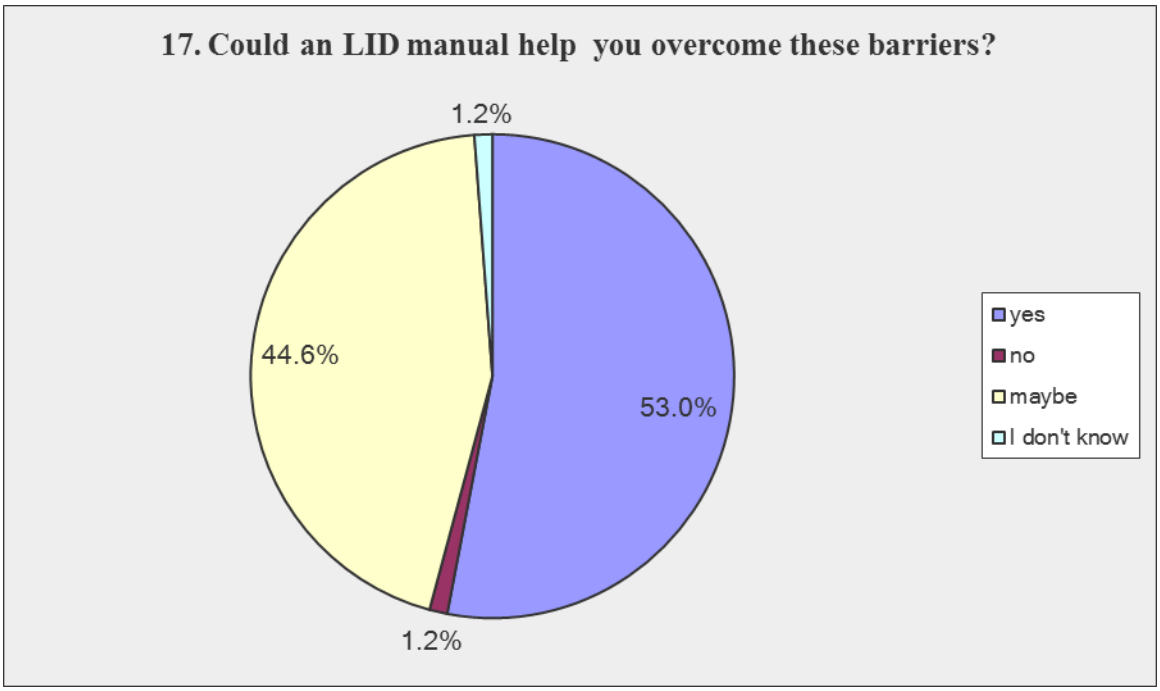

Figure 27: Percentages based on a response count of 83.

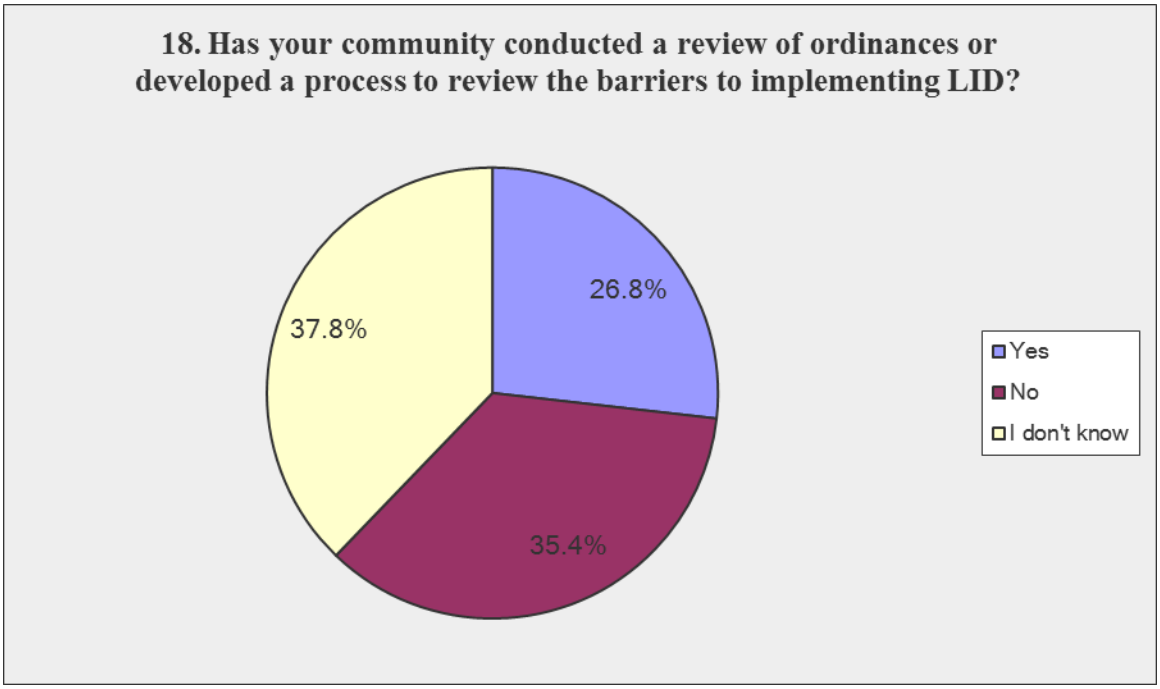

Figure 28: Percentages are based on a response count of 82.

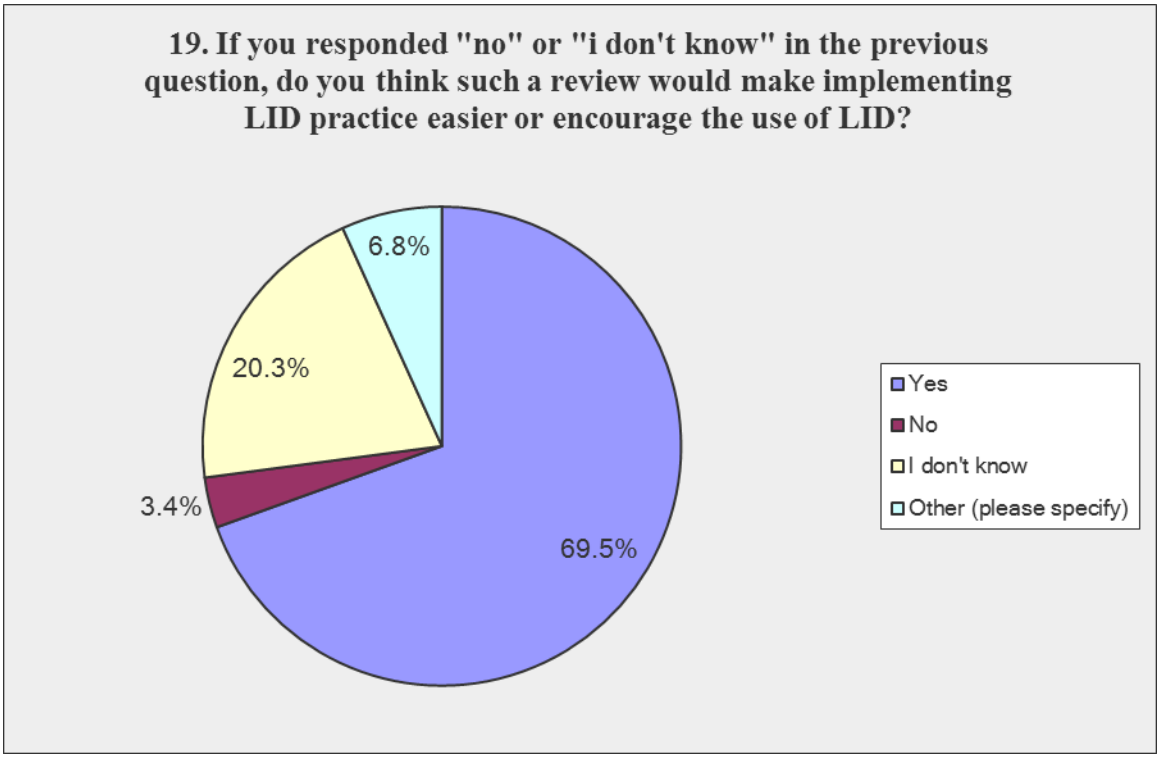

Figure 29: Percentages are based on a response count of 59.

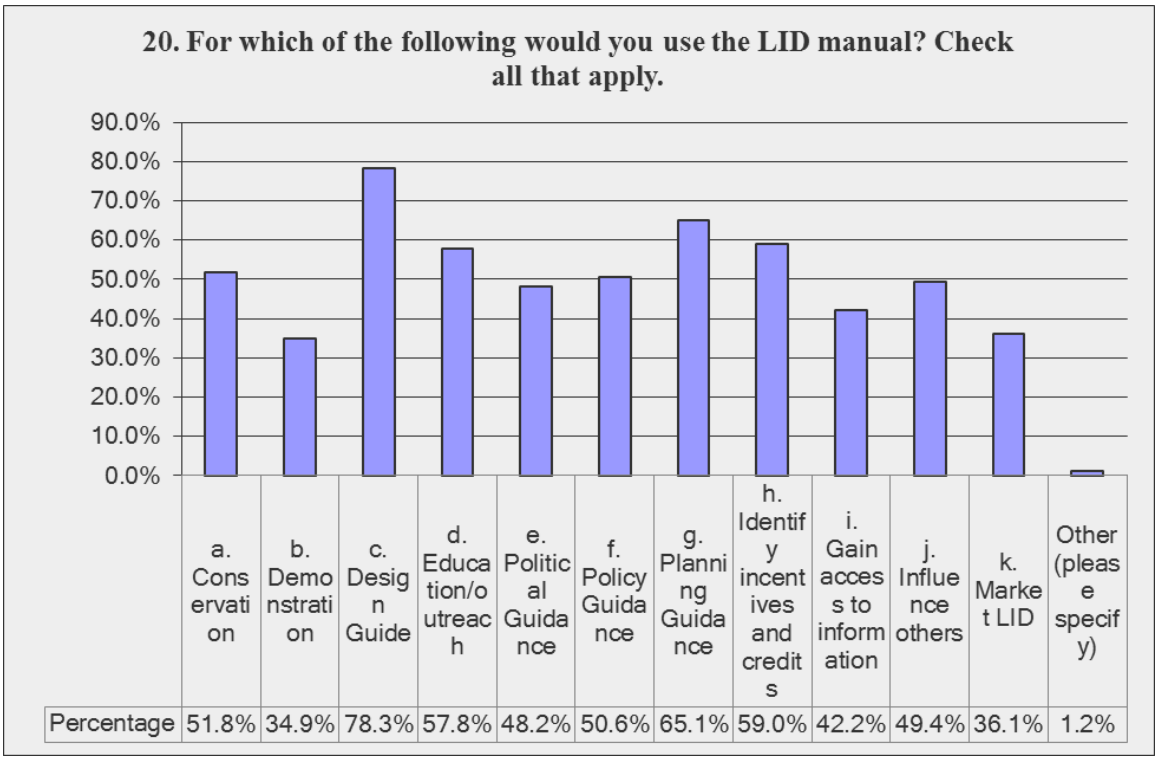

Figure 30: Percentages are based on a response count of 83.

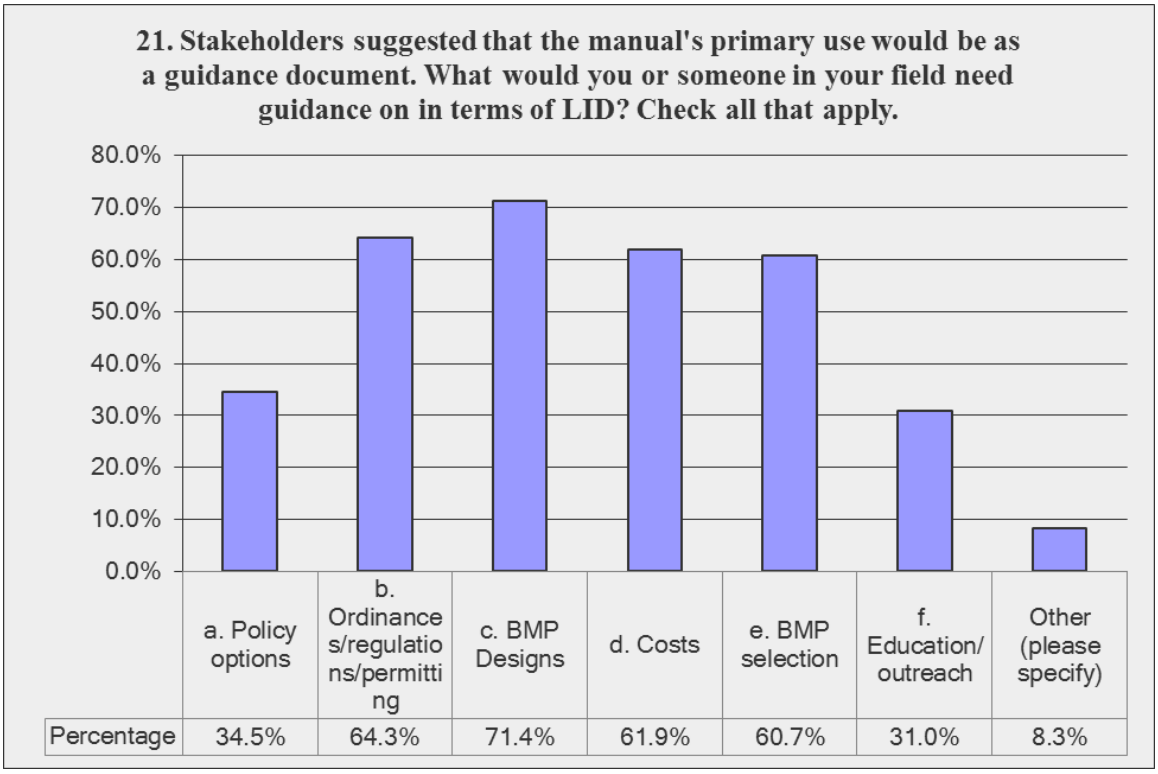

Figure 31: Percentages are based on a response count of 84.

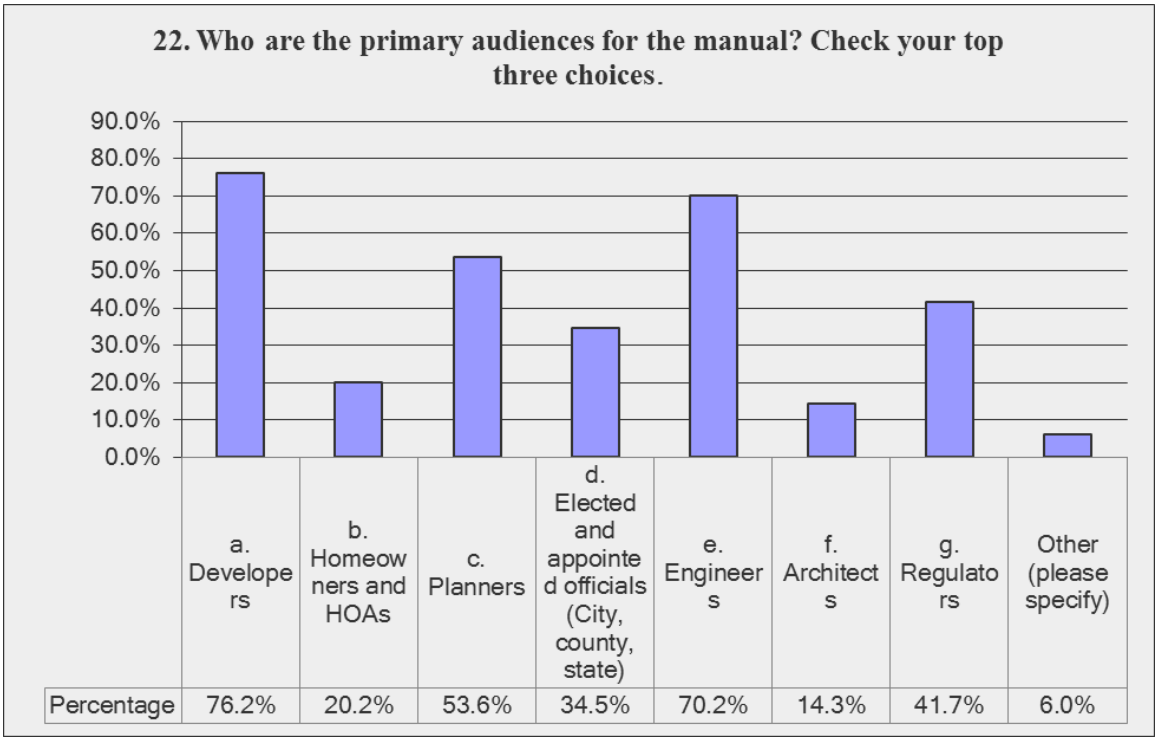

Figure 32: Percentages are based on a response count of 84.

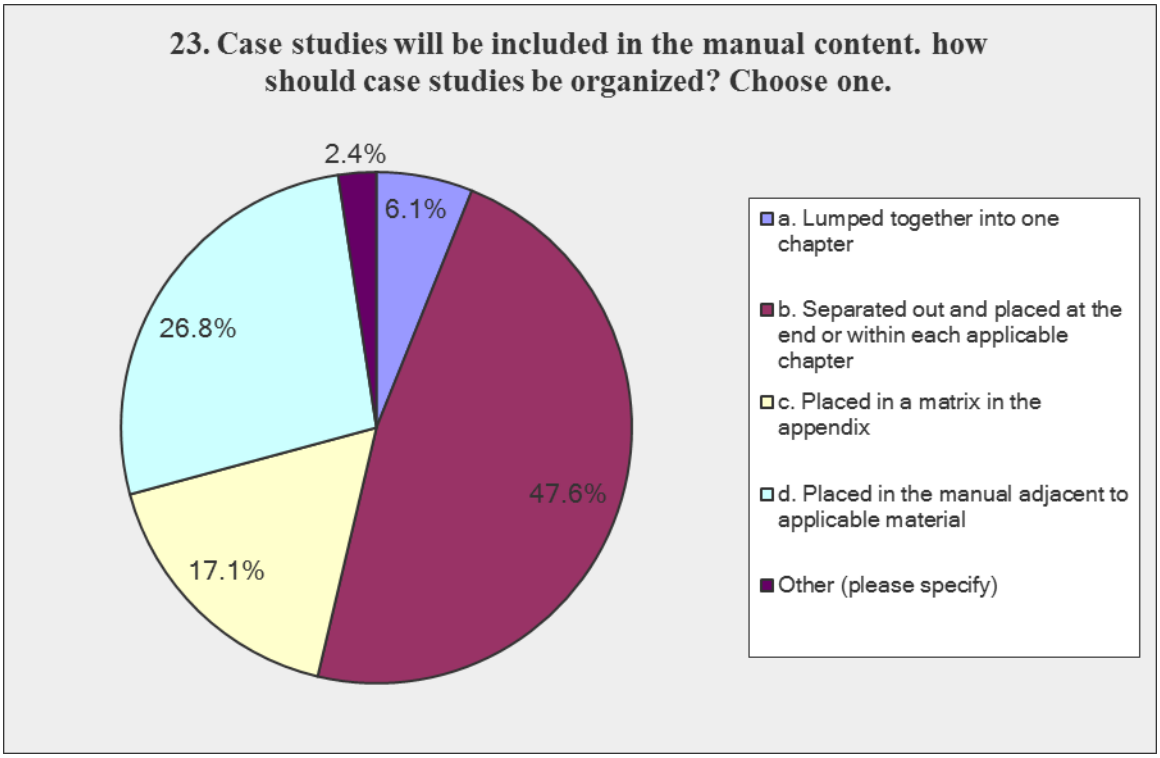

Figure 33: Percentages are based on a response count of 82.

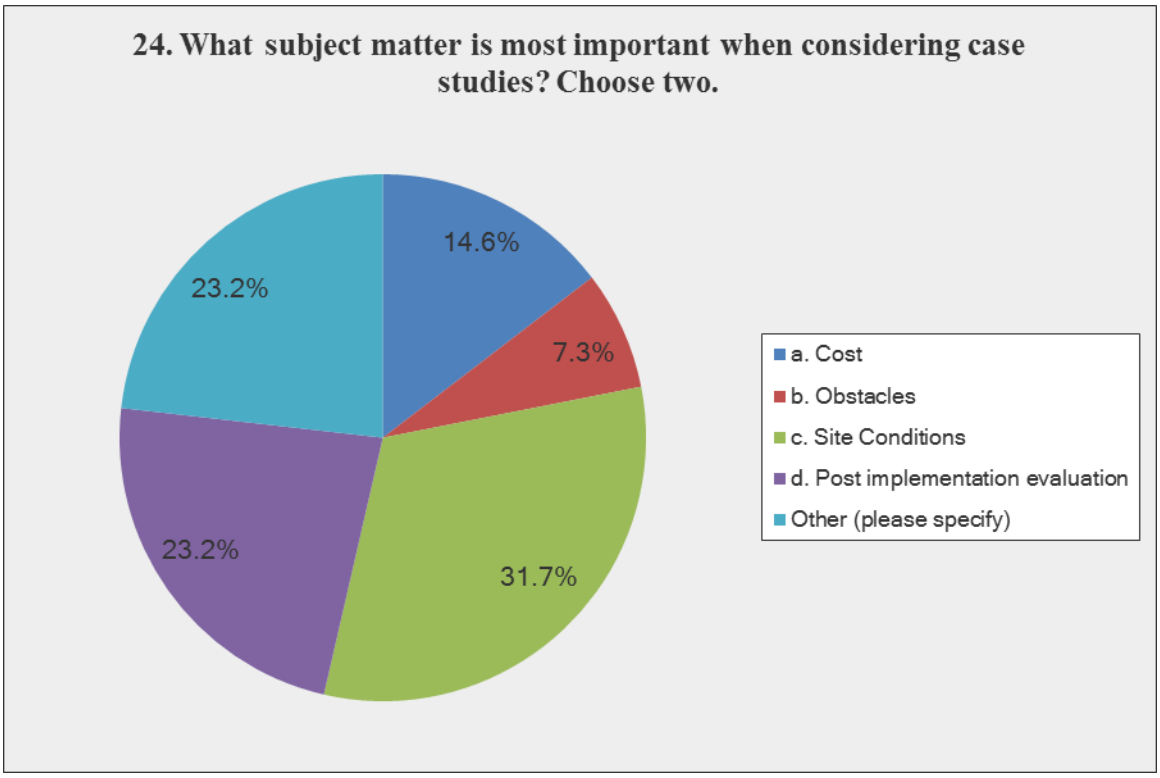

Figure 34:

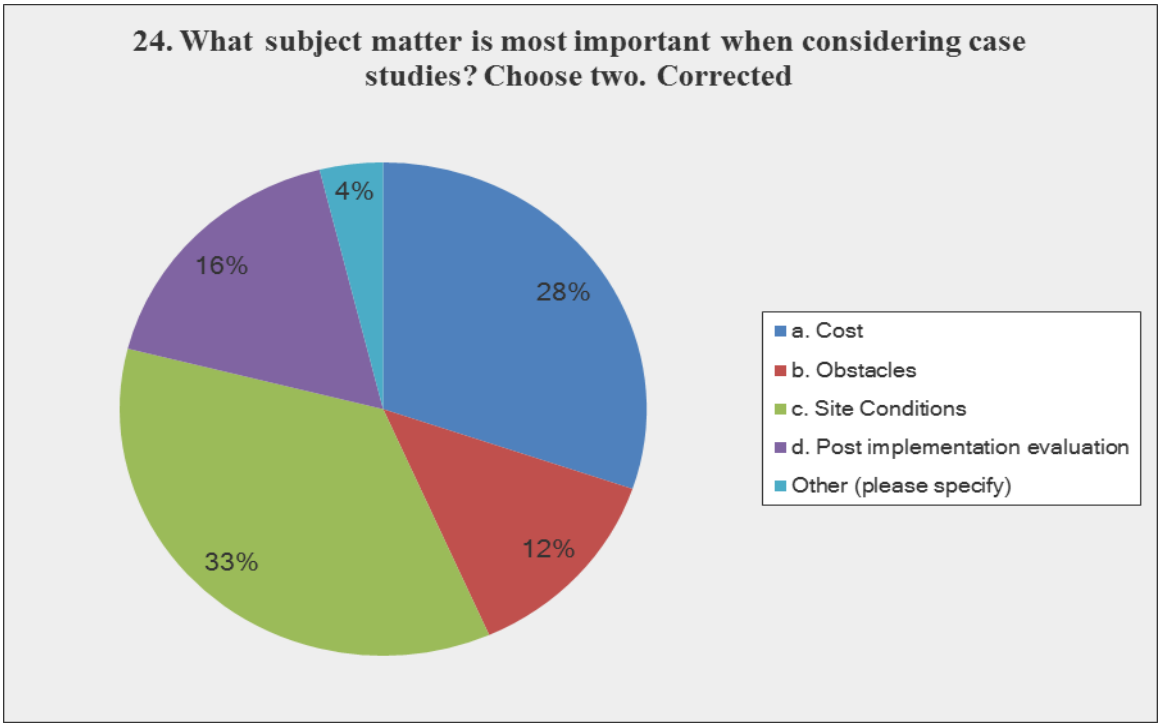

Figure 35: Percentages are based on a response count of 82.

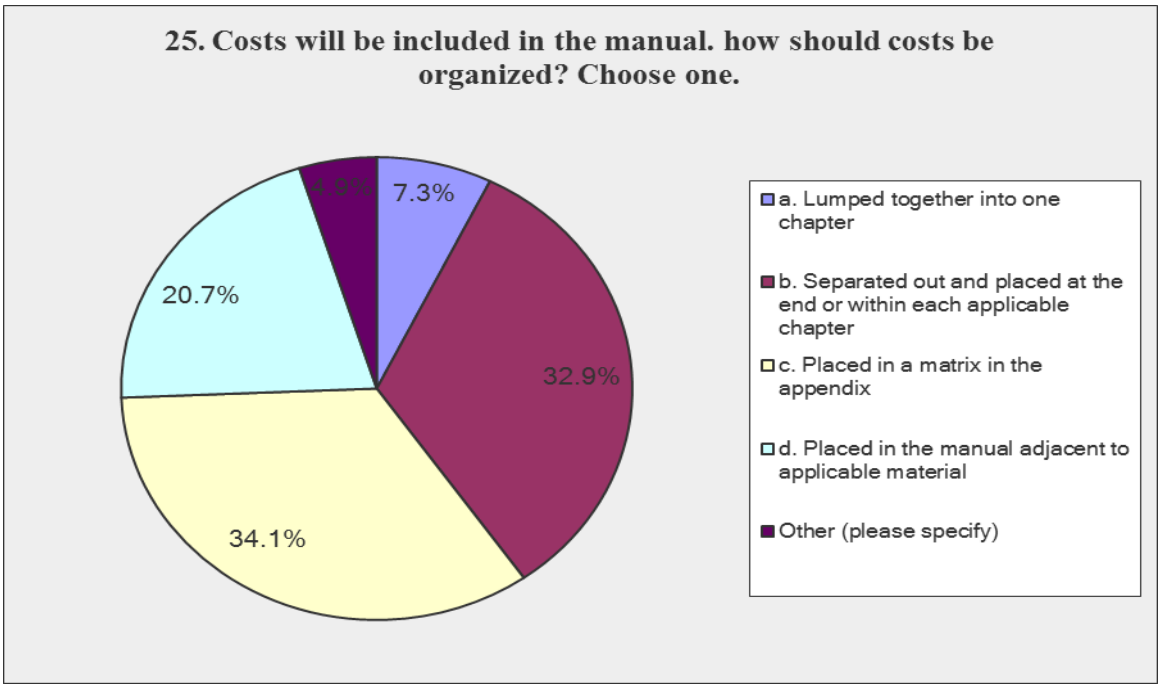

Figure 36: Percentages are based on a response count of 82.

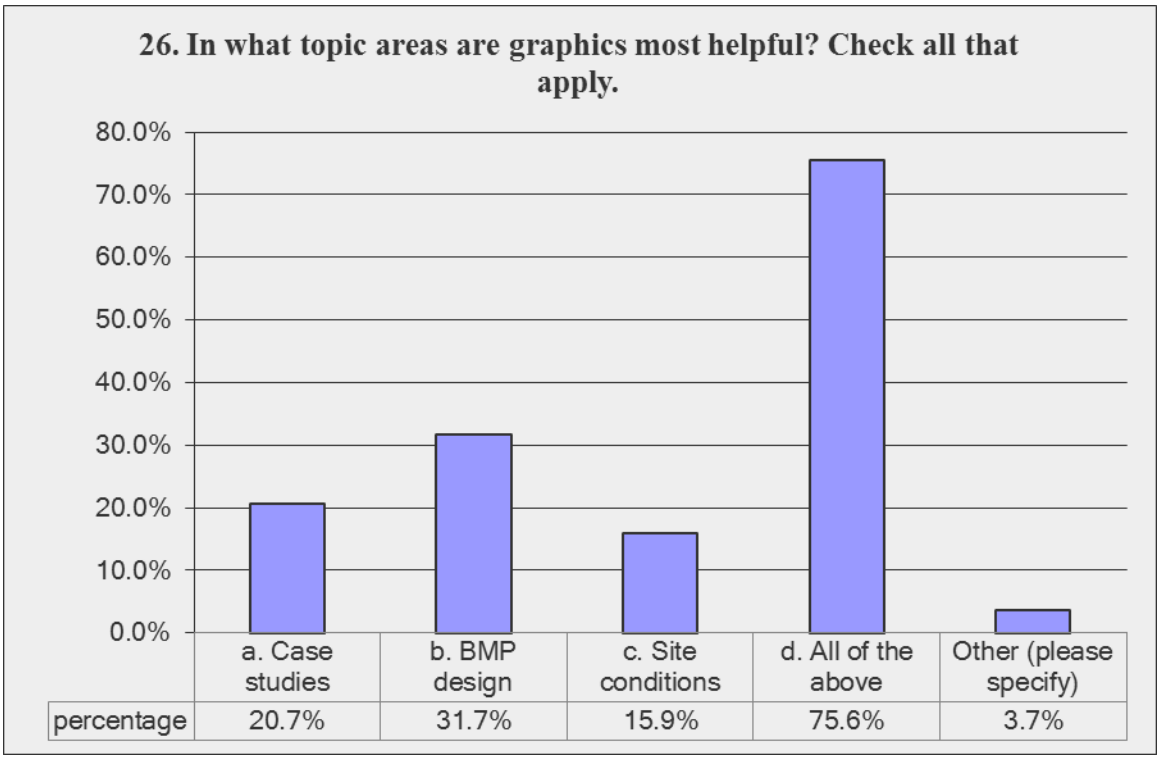

Figure 37: Percentages are based on a response count of 82.

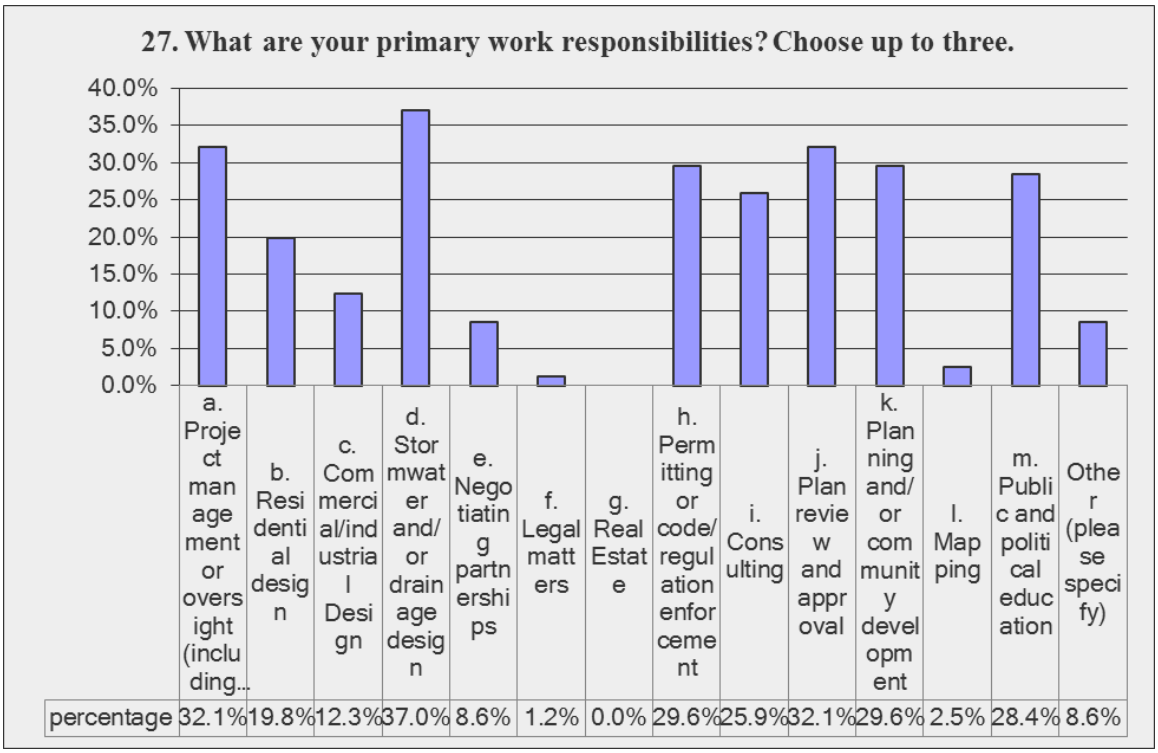

Figure 38: Percentages are based on a response count of 81.

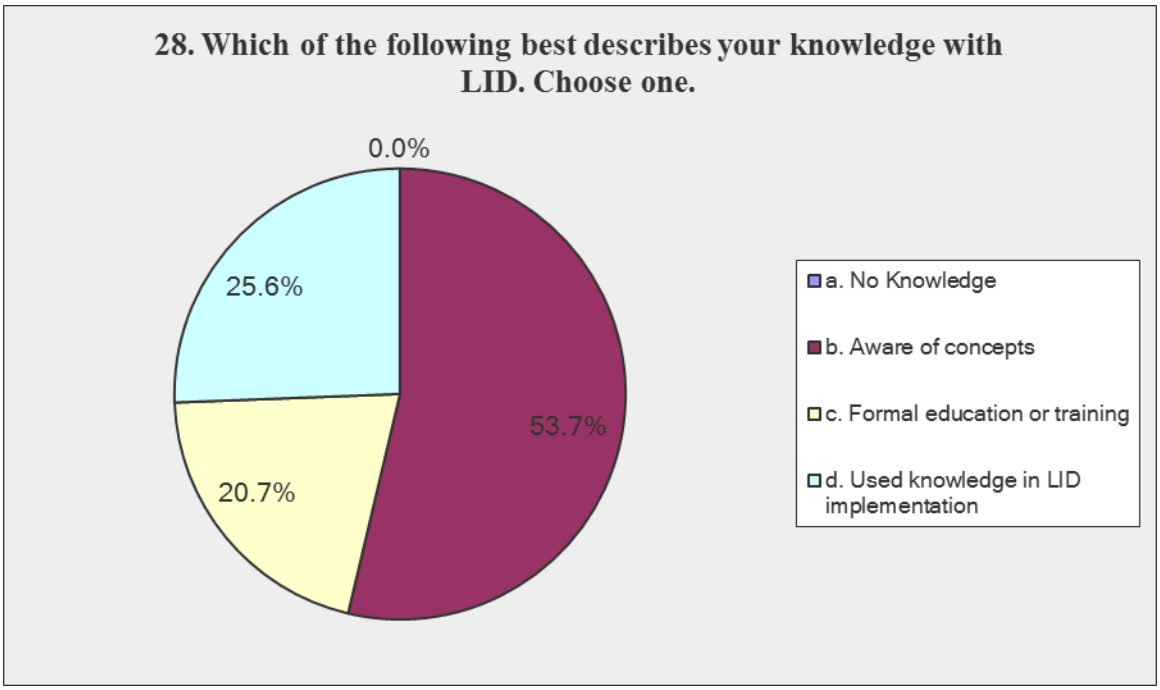

Figure 39: Percentages are based on a response count of 82.

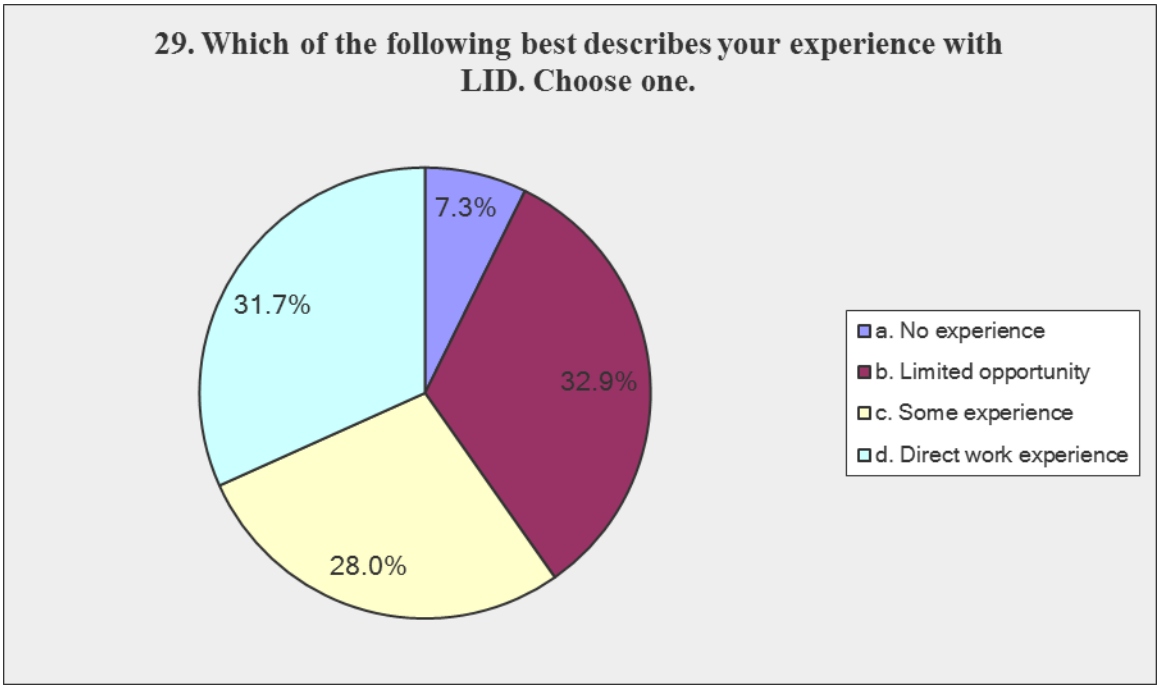

Figure 40: Percentages are based on a response count of 82.

Table 4: Additional comments

30. Any additional Comments?
Nothing to add.
For an example of a good manual layout, please look at "Green Streets" Innovative Solutions for Stormwater and Stream Crossings; produced by Metro in Portland, Oregon.
Save our planet!!!
This is great! Thanks for what you are doing - the state is in much need of a resource of this nature.
The LID Manual will be most useful for design/construction engineers who need to break out of the status quo and design for LID BMPs and for regulators to easily identify performance standards and approve LID BMP designs.
Thanks for doing this.
Thank you for your work.
Thank you for the opportunity to contribute.
The case has to be made in very practical terms -- in the long-term, thiis will help you AND the environment. Developers need special attention, because they're not interested in the long-term,
Tree protection during construction and revegetation with appropriate, native plant material should be included
To reiterate, it is important to keep in mind the aspect of place-making, and environment where people feel comfortable, safe and enjoy being. A coffee shop with a detention pond is not pleasant. Every house needing a rain garden is not affordable, nor safe. Excessive infrastructure is costly for a community that should invest in sidewalks. Expensive 'green' products do not perform better, than simple, time-tested tools. Serving suburban sprawl, separated land use pods, and auto-centric scale is not sustainable.

Appendix H: Sample Table of Contents.

LID Background Information
Audiences:

- Developers/Landscape Professionals/Architects
    - BMPs
        - Design
        - Maintenance
        - Performance Standards (table/spreadsheets)
        - Installation (checklists)
        - Costs
    - Project Phasing
    - Credits and Incentives
    - Case Studies that consider site conditions
- Regulators/Planners/Stormwater Managers/Public Works
    - BMPs
        - Design
        - Maintenance
        - Costs
    - Model ordinance
    - Ordinance Review guide
    - LID Benefits
        - Cost Benefit Analysis
    - Case studies that outline implementation strategies
- Homeowners/HOAs
    - BMPs
        - Maintenance (checklists)
        - Costs
    - LID Benefits
        - Credits and Incentives
    - Case studies with long term data